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Psychological Review

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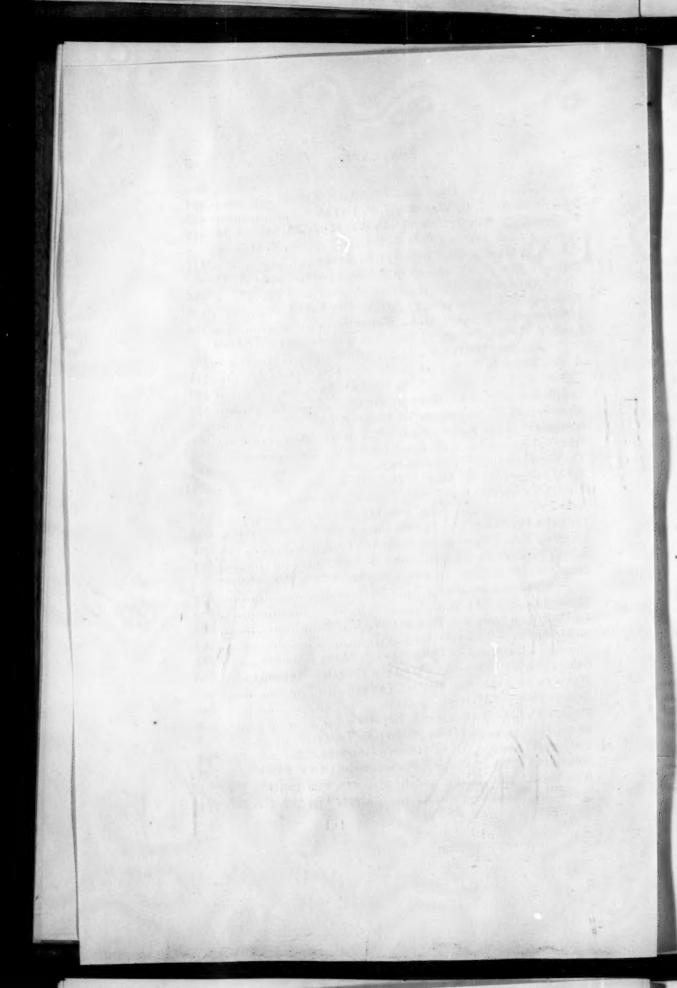
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THE PSYCHOLOGICAL REVIEW.

THE THIRD INTERNATIONAL CONGRESS OF PSYCHOLOGY.

BY DR. EDWARD FRANKLIN BUCHNER.

Yale University.

It is very significant that psychology can claim the attention of an international gathering. Being a science, the most subjective and individual—at least in its subject-matter and fundamental method—it is semi-paradoxical that it should attain this high degree of objectivity. One could see ethnologists, philologists, jurists, sociologists, epistemologists and pedagogues along with anatomists, zoölogists, physiologists and pathologists, mingling with Psychologen von Fach, offering their contributions towards the fuller knowledge of mental phenomena. In the words of the genial and energetic president, "the apt title 'Congress of Psychology,' signifies that there is a welcome extended to every one who communicates or discusses any fact, whatsoever, standing in relation to psychology, in a manner instructive for psychological study."

The history of psychological congresses shows a decided and gratifying growth in the interest for this science. The first international congress in Paris, 1889, under the presidency of M. Ribot, carried the title 'Congress of Physiological Psychology.' Its chief occupation was the study of hypnotic phenomena and telepathic hallucinations. The second congress in London, 1892, under the presidency of Professor Sidgwick, showed by its title, 'Congress of Experimental Psychology,' that a wider circle of phenomena was to be regarded

from the inductive method of investigation. The congresses of 'Rational Psychology,' and of 'Experimental Psychology in Education,' under the auspices of the 'International Congress of Education of the World's Columbian Exposition,' Chicago, 1893, form a chapter in this account, although the controlling theme was chiefly pedagogical. The 'Third International Congress of Psychology,' which sat in Münich, from August 4th to 7th, 1896, under the presidency of Professor Stumpf, of Berlin, revealed a further development. The wide interest in things psychological is indicated by the membership of over five hundred, of whom more than four-fifths were present at the opening session. The value of the sessions, and the contribution of the congress for the science of psychology, may be richly found in the one hundred and seventy-four addresses announced, which were arranged for three general sessions and five sections, the latter being as follows: 'Anatomy and Physiology of the Brain, Physiology and Psychology of the Senses, Psycho-Physics,' 'Psychology of the Normal Individual,' 'Psycho-Pathology and Criminal Psychology,' 'Psychology of Sleep, Dreams, Hypnotic and Related Phenomena,' and 'Comparative and Pedagogical Psychology.'

Graced by the presence of Dr. Prince Ludwig Ferdinand and Princess Therese, of the royal house of Bavaria, the Congress opened with the 'Eröffnungsrede' of the president, Professor Stumpf, of Berlin, in the great aula of the royal university. In sketching the previous congresses, the speaker referred to the new title of the present one, which was ascribed to the suggestions of the Executive Committee. "The adjective 'experimental' appears to me always necessary as against certain ratiocinative, abstract, deductive tendencies which have not entirely died out in Germany. While omitting the adjective 'experimental,' the Committee do not wish to deny its right. We agree that the necessity of experiments is almost universally admitted, and that herein is dependent the avoidance of all appearance of one-sidedness, and harmonious promotion of all tendencies. The disciples and friends of the new psychology are bound together by a common conviction as to method: the decisive importance which all of us attribute to the increase and

refinement of our knowledge of facts. By refinement, I mean especially the treatment of enumeration. Where one has, heretofore, been satisfied with indefinite quantitative designations, we will now count and measure, just as far as it is possible."

Having expressed the most general principles of the methods 'which, in spite of divergencies, bind us in unity,' the speaker gave "utterance also to the most general convictions as to fact; and to what other question can these be attached than to the relation of mind and body, of the psychical and physical? The effort of every epoch concentrates itself in the attempt to win a satisfactory solution for this question determining the entire view of the world. If we all are agreed that the relation to the physical realm penetrates our entire mental life, and, as we make daily progress in the knowledge of the details of this relation, then it will be quite possible to find a more accurate formula, in which our common views as to the nature of that relation may be expressed.

"Fechner, the founder of psycho-physics, influenced by the speculative theories of Spinoza and Schelling, defended the monistic theory, according to which psychological and physiological processes are really one and the same process, body and mind being only the external and internal modes of the appearance of one being. Unfortunately, as everything else in the world, this two-sided theory has its two sides; it is magnificent, poetical, enticing—but dark. The unitary substance, which should 'express' itself in both physical and psychical attributes, is nothing but a word, which only expresses the necessity of escaping dualism, without actually bridging the chasm

for our understanding.

"At the present time, it is the custom to repel such turnings and comparisons, and to regard the secret of the relation as inextricable, handing it over to metaphysics (which generally means the same thing), while maintaining, on the contrary, that the processes in both series are parallel throughout, without acting upon each other or uniting themselves in reciprocal action. There are two forms of the theory of parallelism. According to one view, the physical series is causally bound together, while the psychical possesses no causality in itself,

as little as shadows or images act upon each other. 'Consciousness in itself is absolutely nothing!' The second view regards the psychical series as an unbroken, causally-con-

nected development.

"But this doctrine of parallelism is the old dualism once more, which has never appeared under a coarser form. In opposition to this we must ask the question whether the consequences of the investigation of nature, and especially the doctrine of evolution, does not impel us to conceive the world as a totality, causally connected in all its parts, in which everything performs its task, none being excluded from the general reciprocal action. It may be inquired still farther, whether the grounds on which the total psychical world should be excluded from the actual, or from the universal reciprocity, are so constraining as they appear to many. Hume pointed out that cause and effect need not be homogeneous. Experience can only teach what belongs to each other as cause and effect. The law of the conservation of energy is in agreement, since it is a law of transformation. Certain psychical functions are united with a continuous consumption of physical energy, others, likewise, with a continuing production (of such energy). So far as I can see, a psycho-physical mechanics is conceivable, which sets the spiritual processes in a universal, lawful, causal connection, and thereby establishes a monistic view in the true meaning. For, it is not so much the similarity of elements or processes as the universality of the causal connection and the unity of the last and highest law which we must demand of a unitary world.

"For those who are thus not satisfied, another way remains open in which to set the physical in the universal causal connection without violating the law of energy. We might say, a definite nerve process in a definite region of the cerebral cortex is the indispensable pre-condition of the rise of a definite sensation. This follows out of the neural process as a necessary sequence along with the physical effect (so much to distinguish it from the theory of parallelism). But this part of the sequence absorbs no physical energy, and its relations to the conditions cannot be expressed by mathematical concepts and laws.

"I may briefly allude to a shifting of the entire question, which attempts to clear away the difficulties more radically by pointing out the separation of the two realms as a mistake from the very beginning. The physical may be only the sum of sensations or ideas of our mind, as, on the other hand, the mental life may arise out of sensuous representations. Hence, one can not speak of a difference between the two realms. I bow respectfully before the epistemological height which here discloses itself, but refer to the fact that even from this point of view one group of sensuous representations, which possess mathematical-physical properties, is distinguished from another group which does not possess them. I cannot discover that dualism is really overthrown by this so-called epistemological monism. It only changes the position.

"In the future we shall continue to regard our sense perceptions as the effects of the external world, and our wills as the cause of our actions, without being compelled to look upon this manner of expression, which obtrudes itself upon the ordinary consciousness, as a figure of speech. Since the time of Descartes and Spinoza investigations on body and mind have attained extraordinary precision. The philosophical analysis of the concepts of substance and causality, the discovery of the law of energy, the rise of psycho-physics, the victorious permeation of the theory of evolution, the progress of the anatomy and physiology of the central organs, especially the investigations on the localization of mental activities-all has contributed to dissecting the one question which lay before us in a lump. It is our one problem to remove every tendency to dogmatic stiffness, and not, as the common man, speak most easily and confidently about things most difficult."

This critical review of the culminating psychological problem opened the labors of the Congress, whose members were welcomed, in the name of the royal government of Bavaria, by his Excellency, Ritter von Landmann, on behalf of the city of Münich by Vice-Mayor Brunner, and to the royal university by Professor von Baur, Rector magnificus, whose greeting was especially cordial towards the members from America.

In the polished address, 'Etude biologique sur la douleur,'

Professor Richet, Paris, presented views which are quite different from those which he put forth in 1877. "Considering pain as a chapter in experimental physiology, the first question which presents itself is this: What are the nervous excitations which produce pain? The electrical stimulus, of which the intensity can be gradually increased, is employed. From the point of view of our sensibility there are three phases in the excitation: the first phase, in which the stimulus is too weak to call forth any sensation; the second phase, in which there is painless sensation; the third phase, in which the sensation is painful. With all other kinds of stimuli upon the various senses, we find exactly these three phases. The normal state of the nerve is in a certain mechanical, electrical, chemical, and thermic condition. Pain is produced by all causes which profoundly modify the state of the nerve. Not only in the case of peripheral excitations, but internal stimuli of an organic or pathological sort also produce pain when the excitation reaches a certain stage. The local effect of a strong excitation is always the same. It is a disorganization of the nerve, and the impossibility for this organ to perform its normal function during a certain length of time. As a guard against disorganizing and destructive excitation, all organisms have two kinds of defense, the immediate defense, which is reflex action, and the subjective defense, which is pain. From a first superficial examination it appears that pain has no utility. There is a vast number of lower organisms which defend themselves by reflexes, without any knowledge of pain. But, besides the defensive reflexes, the higher organisms perform a specal reaction, absolutely subjective, which is pain.

"The persistence in memory of a painful excitation is one of the fundamental characteristics of pain. We wish to insist on this one of the essential conditions of pain, which is its duration. The scholastic axiom, sublata causa, tollitur effectus, is absolutely false. We forget pleasures much more easily than pains. We are organized in such a way that we fly from all causes of the destruction or perversion of our tissues. Pain is considered as the supreme evil, and thus the function of pain is that of utility in accordance with the end of nature. I wish to make a plain confession. It is this: the principle of finality, which

formerly appeared very ridiculous to me, seems to me to-day, after long reflection, absolutely necessary in physiology. The purpose of nature is to keep alive the greatest number of beings, the longest time possible.

"Pain may well be regarded as one of the bases of intelligence, since it is the memory of pain which rules the conduct of beings which are more than pure automata. In the case of man, each pain modifies his psychical structure, forcing him to reflect. It is by pain, as much as by sensation that we appreciate the external world; our conduct is immediately modified by the pain which external objects have provoked. A single perception does not have an intimate influence on our sensibility, but a painful sensation provokes an emotion which continues a long time, and exercises a great influence on us by its force and the vivacity of its persistence."

An opportunity, where the scientific study of abnormal mental phenomena may be of aid to the jurist, a field which has so far been almost entirely overlooked by psychologists, was shown by the critical address, 'Die Strafrechtliche Zurechnungsfähigkeit,' by Professor von Liszt, Halle a. S. Starting with the definition: 'Accountability is the capacity of being punished for past actions,' the speaker proposed the question, 'How must this state of mind be constituted?'

The penal codes of the present attempt to answer the problem in various ways. While the oldest group emphasize the freedom of the will, another finds the accountability in the intellectual factor, viz., insight into the consequences of the deed, and a third limit themselves to the enumeration of the circumstances through whose presence responsibility is excluded. The German penal code adopts the first position, against which the criticism was offered that the 'right of punishment, as every other form of right, must remain removed from the unending discussion on the freedom of the will.' The 'intellectual moment,' also is insufficient, since the individual may, indeed, distinguish right from wrong, and, at the same time be abnormal in feeling and volition. 'The mind of the criminal must be conceived of as a unity, a totality.' Accountability can be regarded only as the normal (not free) determinableness through motives, and is conditioned by mental maturity. While insisting, in spite of this position, that the irresponsible, habitual criminal should be punished, the speaker only made a concession to the ruling ethical judgments. Without giving a positive determination of accountability, the lecture closed hoping to find the agreement of psychologists with the view that 'a punishable deed is not present when the actor, at the time of the performance of the action, was found in a condition of unconsciousness, of morbid checking or impairment of mental activity.'

The chief interest during the Congress was incited at the opening of the general session on Wednesday, by the address 'Ueber die Associationscentren des menschlichen Gehirns,' in which Professor Flechsig, Leipzig, presented anew, with demonstration, the results of investigations which are already somewhat known.

After a rapid survey of the development of the theory of localization of mental functions in the cerebral cortex, he defined his relations to his predecessors, especially Munk and Hitzig, and, in opposition to the clinical, pathological method, described his own as the historical method of anatomical development, in so far as it traces the growth of the nerves successively appearing in a normal way. "The various kinds of tracts which enter into relation with the cortex do not arise simultaneously. But few medullary fibres are found in the cerebral bundles of the ripe fœtus. The first to develop are the sense tracts, the centripetal nerves, which unite the peripheral organs and the organs within the body, with the cerebral cortex. anatomical method traces this early development of the sense tracts in the fœtus and newly born much more clearly and sharply than any other. The peripheral organs are not united at the same time with the cortex. Their order is rather that of a series, which is started by the development of the tracts which unite the posterior roots of the cord and their continuing nerves. They may be called the 'bodily-feeling' nerves, and contain fibres serving the organic functions of pain, hunger, thirst, etc., and those which contribute to a feeling knowledge of the body. The first impressions which the cortex receives

are conducted by these bodily-sense nerves, from which it is seen that the consciousness of the body precedes that of the external world.

"The olfactory tract appears about the same time. Considerably later the optic tract develops, and is found already sheathed to the cortex in the mature fœtus. Finally the auditory tract appears, but only the portion of it which is connected with the cochlea, and, more particularly, only that part which is imbedded in the cerebral lobe.

"The following fundamental propositions may be formulated respecting the extent and arrangement of the cortical sense centers, the 'sense zones' of the cerebrum: I. In man these zones fill about one-third of the cortex. 2. They do not present a continuum, but are separated from each other by cortical circuits in which neither sense nor motor tracts appear. 3. They form four distinct spheres of varying extent; bodily-feeling (which includes the tactile center), olfactory, optical and auditory centers. (A particular gustatory center cannot be

pointed out. It unites with the first or second.)

"The continuation of the posterior roots collects in a region which is in the middle of the total cerebral cortex, particularly about the central fissure. The olfactory fibres enter the basal region of the brain, partly in the frontal lobe (reaching to the gyrus fornicatus), partly in the temporal lobe. The optical tracts end in the region of the occipital lobe which is especially marked off by the fissure calarina. The auditory tract enters the first temporal convolution, especially its two roots, and lies concealed in the depths of the fissure of Sylvius. These conclusions, based entirely on the method of anatomical development, are brilliantly confirmed by the evidence of cerebral pathology.

"Comparing the finer structure of the cortical centers, it is discovered that the chemical senses, at least, possess a special structure, conditioned by the appearance of peculiarly formed cells, and a special arrangement of the layers of ganglion cells.

"All the motor tracts of the cortex proceed from sense centers. By far the greatest number take their rise in the bodilyfeeling center, while scarcely one-fifth arise in the field of audition. As respects the sensory functions of these centers, it is undoubtedly true that the destruction of a center in the cerebrum puts an end to the corresponding peripheral sensations.

"Can the newly born associate the perceptions of the various centers? In reference to the anatomical condition discovered in the infant's brain, this question is to be answered negatively. The cortical fields of the special senses are almost completely destitute of tracts which bind them together. There are wide regions between those fields, in which matured, medullated fibres are absolutely wanting. Single, scanty fibres, which appear to be developed sufficiently to transfer an excitation from one sphere to another, run only between the olfactory and bodily-feeling centers. The infant has, presumably, a great number of separated circles of consciousness, corresponding to various sense centers.

"What is the significance of this great complex of undeveloped regions between the centers of sense? Following the anatomical development of the cerebral tracts, we secure a satisfactory explanation as to the function of these blank, intermediate regions. As early as the second month after birth, a multitude of medullated fibres begin to appear, pushing out from the sense centers into the intermediate regions, to be lost in the cortex. With the farther growth of the infant, millions of such associational fibers stream into these formerly blank regions. Each center is the starting point of innumerable associational systems which meet, in the convolutions, like systems springing from the other centers. With reference to these anatomical facts, the intermediate regions may be called 'associational centers.' Rather than separating the sense centers from each other, they bind them together—to be sure, only several months after birth and later.

"There can be scarcely any doubt that the fusion of the activity of the various sense centers is a 'higher' mental function than the formation of single sense perceptions. That which we call thinking, first begins with the association of the several sense activities. That neural condition which makes man the psychical being that he is, is given chiefly in his 'associational centers.' The most convincing proof of their relation to those psychological processes, which we designate collectively under the term 'association of ideas,' is furnished by pathological evidences from the impairment of those regions by disease and the consequent mental disturbance.

"Investigations on a basis of anatomical developments show three groups of these centers, which are completely separated from each other. The 'posterior associational center,' which is the largest, lies in the region between the tactile, visual and auditory fields, and partly between the last two and the gyrus hippocampi. A considerably smaller region forms the point of the frontal lobe, especially the base, and is the 'anterior center.' The 'central associational center' is the smallest and lies between the others, corresponding exactly with the island of Reil. It is now the problem of pathology to establish the significance of these single regions for the mental processes. Pure and experimental psychology alone cannot accomplish anything here. Many of these functions are already known from the pathological cases, as, e.g., the different forms of aphasia, amnesia, etc. Many clinical cases show that the knitting of various perceptions and their memory images takes place in these This combining is, presumably, a consequence of specially extensive groups of cells, whose function consists exclusively in 'associating,' and this is the point where the speaker departs entirely from the usual views as to the mechanism of association, as they have been formed by Meynert, Wernicke and others.

"Since there is no proof that the injury of the associational centers influences sense perceptions, in the restricted meaning of the term, these centers can be said to take a part in perception, in the wider sense, by conducting the memory images to the bare sense impressions. It is highly probable that we are to look for the memory traces of impressions chiefly in the ganglion cells of these centers. The single convolutions of the associational centers are in no wise similarly related. The regions bordering the sense center, which might be called 'marginal zones,' are united with more numerable systems than those farther removed. The collective central regions are united by 'long' associational systems (fasciculus arcuatus) with the

sphere of bodily-feeling, which may be regarded, from its comprehensive combinations, as the truly central point of the entire cerebrum. Thus only is there an actual unity of psychical mechanism, and not by extensive associational systems which unite the great centers with each other directly. The entire cortex is a powerful, associative organ, in certain fields of which the peripheral tracts stream in, and in which the motor tracts take their rise.

"Is the quality of consciousness, mediated by the sense centers, actually different from that which is released in the associational centers? This is a problem for the future.

"The fields of sensibility and of association are spatially separated; but in the anatomical and functional elements they are so closely connected that a sharp separation between them, in a fully developed organ, is impossible. Without the associational centers it would be absolutely impossible for us to fabricate, into a unitary totality, the information which the several senses give us of one and the same external object." The discussion which followed was the most lively and largely participated in during the entire congress.

In an address, 'Dov' é la Sede della Emozioni,' Professor Sergi, Rome, communicated the results of investigations which were published in a large work, 'Dolore e Piacere, Storia naturale dei Sentimenti, Milano, 1894.' The location of the feelings is not in the brain, in the restricted meaning of the term, where the phenomena of consciousness show themselves, but in the medula. The location of the emotional stimulus, however, is peripheral, since these are only changes in the circulation of the blood, in the food supply and respiration, etc.

The light thrown by genetic psychology upon the hidden relations between the somatic and psychical conditions of experience, and upon the profounder philosophical problems of mental life, was traced in 'Die Psychologie des Kindes,' by Professor Preyer, Wiesbaden.

The third and last general session, with which the labors of the congress were ended on August 7th, brought together the following addresses, whose interest lay not alone in the variety of themes and treatment: 'Zur Lehre von der Empfindung,' by Dr. Brentano, formerly Professor of Philosophy, Vienna; 'L'influence somnambulique et le besoin de direction,' by Professor Pierre Janet, Paris; 'Ueber eine neue Methode zur Prüfung geistiger Fähigkeiten und ihre Anwendung bei Schulkin dern,' by Professor Ebbinghaus, Breslau; 'Ueber das Gedächtniss für Sinneswahrnehmungen,' by Professor von Tschisch, Dorpat; and, 'Der Begriff des Unbewussten in der Psychologie,' by Professor Lipps, Münich.

Almost every phase of theoretical and applied psychology was considered in one or more of the scores of Vorträge, which were assigned to the several comprehensive sections. The presentation and discussion of this varied material occupied the four sessions for each section. Among many others of interest and importance was the address by Dr. Ehrenfels, Vienna, 'Ueber ethische Werthgefühle,' which critically modified the fundamental tenets of Utilitarianism, in its attempt to explain the ethical feelings of approbation and disapprobation from the knowledge of utility or harm. Whether the social ethics of Utilitarianism offers a satisfactory explanation of individual ethics is a remaining question. The discussion of 'Psycho-physische Principienfragen,' by Dr. Cornelius, Münich, developed a set of propositions which do not agree with Müller's 'psychophysical axioms,' but essentially simplifies psycho-physical theories by the adoption of certain assumptions.

The demonstration by Professor Sommer, Giessen, of a skillfully arranged apparatus for registering the finer bodily movements, e. g., of the hand, which are three dimensional, upon a surface, excited no little interest. The sensitiveness of this 'micro-motorgraph' approaches the so-called mind reading. The members of the congress highly appreciated the successful demonstration of the 'Röntgen rays' by Professor Graetz. The exhibition of psychological apparatus showed that the 'new' psychology is rapidly enlarging its equipment, and increased one's faith in the importance of the dexterous psychological mechanic.

The ultimate value of the congress for psychological science remains to be seen. The scientific consciousness was intensely astir, but the patient sifting of facts and theories can only come later. That psychology possesses such a grand army of investigators is the *Hauptsache*. Their coming together sends abroad the inspiration of the elbow-touch. The plans of the Executive Committee, in connection with the labors of the contributors, could not be excelled, either in spirit or scope. The pusillanimity of prejudice was conspicuously absent. More liberality could not be shown than that all facts and every theory were given a hearing. Struggling with the supreme psychological problem, with which the president launched the Congress, it might be said that the tendency of its labors was against that ideal subjectivism which has, for the most part, been the historical product in every philosophical age. There was a tempering mindfulness that scientific psychology must bravely meet the problems growing in its own soil, before turning them over either to physics or philosophy.

The magnificent entertainment provided for the members of the Congress has endeared the city of Münich in the psychological hearts of many nations. The reception given by the city of Münich in the hall of the old Rathhaus, the visit to the brewery 'Zum Spaten' under the guidance of the cordial proprietors, Sedlmayr Brothers, and the special rendering of 'Don Giovanni' in the Royal Theatre, were social fêtes unchecked by the unfavorable weather which set aside other efforts to stimulate pleasurable psychoses in the psychological guests. To these were added the enjoyment of the scientific and art collections thrown open by the state to the members of the Congress.

The official labors of the Committee modified the organization to a certain extent, the details of which had not been fully completed. As officers of the fourth international Congress, Professor Ribot was elected President, Professor Richet, Vice-President, and Professor Janet, Secretary, all of Paris, where the session will be held in 1900, during the international exposition.

[It is hoped that many more of the papers presented at the Congress can be noted in these pages when the 'Proceedings' of the sessions reach us.—Eps.]

RICHARD AVENARIUS.

BY J. KODIS.

Chicago.

On the 18th of last August Professor Richard Avenarius of Zurich died after a long and painful illness affecting both heart and lungs. He was still a middle-aged man, but he destroyed his health through the enormous mental effort which he made to raise modern philosophy from its present passive state to the high rank of the science of sciences, capable of directing, as of old, the thoughts and actions of humanity. In Richard Avenarius philosophy loses one of its most sincere, most devoted students, whose whole life was a sacrifice on the altar of science. For, having a high ambition, he was one of those few men who are capable of sacrificing small vanities and easy successes to a far purpose, which they do not expect to see realized during their own life. Thus he worked for the future, having for his own share nothing but disappointments and disillusions.

To read the works of Avenarius, and especially his chief book, 'Kritik der reinen Erfahrung,' is not an easy task. His terminology presents an almost insurmountable difficulty for most students of philosophy. In spite of this, Avenarius formed a school—a small one, but composed of men devoted to his ideals. He produced a complete system of philosophy, new methods of investigation of the laws of knowledge, and consequently he grouped around him a number of students, who are working in the field which he explored. The terminology that he used was partly necessary for the denomination of the new phenomena that he pointed out, but partly resulted from the extreme care which he took to prevent all possible changes as well in physiological as in psychological theories; and in consequence of this last-named peculiarity it becomes a real burden

to read his books. This was, perhaps, the chief reason why his theory did not have at once a great success. His philosophy is not to be read, but to be studied like a treatise on mathematics or physics. But any one who undertakes this hard work will be sufficiently recompensed by the enormous wealth of ideas, new perspectives and methods, which are contained in this work.

The first philosophical paper that Avenarius published was in 1868. It was an investigation of Spinoza's system: 'Uber die beiden ersten Phasen des Spinosischen Pantheismus.' From the time of his study of the system of this philosopher he maintained the tendency to seek for one single principle in the multiplicity of our experiences. This principle Avenarius believed was to be found in the laws of knowledge. Therefore, it was not an objective but a subjective principle on which he based his monism. Philosophy became for him a means to obtain 'a central position toward the world.' Therefore one strong and closed system of ideas, subordinate one to another, must necessarily result from this point of view.

His next paper, which was published in 1876, 'Philosophie als Denken der Welt, gemass dem principe des kleinsten Kraftmasses,' shows three most important developments:

1. Being brought up in the psychological theories of Herbart, he endeavors to give to the facts discovered in psychical life by Herbart a biological basis. He explains the laws of assimilation of the new groups of representations by the older ones, the laws of subordination of notions one to another, etc., by the vital processes of the organism, which processes consist in the preservation, as far as possible, of the state of equilibrium, or, in other words, in the economy of the organism.

2. The general notions being formed, according to Avenarius on the same biological principle, he considers them not as entities, but rather as means directed toward the formation of our knowledge of the world. In so far as they fulfill this purpose, they are good; when they do not serve this end, they have to be transformed to correspond to our experiences. He undertakes the analyses of some of the notions considered as most fundamental in modern philosophy, such for example, as

notions of substance, matter, 'Ding an sich,' etc., and finds them constructed on a false basis and rather obstructive than helpful to the development of knowledge. The notion of movement and the notion of sensation are alone sufficient to explain all phenomena. This is a kind of objective idealism, which Avenarius afterwards abandoned for realism, conserving always his critical attitude toward the general notions and trying to find the laws of the 'natural history' of their development.

3. The most important point in this paper is the subordination of psychical phenomena, as a part of life-phenomena, to general mechanical rules. Therefore it considers the biological fact of self-preservation of living organisms within certain limits as being a case of the law of stability (Beharrungs-princip). The whole psychical life is considered by Avenarius from this point of view, namely, as a function of the self-preservation of the organism, or, in case of its becoming disorganized, as the function of the self-preservation of a partial sys-

tem of the organism.

'Philosophie als Denken der Welt' was announced to be the prolegomena of a larger work which followed twelve years later, in 1888. This was the 'Kritik der reinen Erfahrung. Avenarius was impressed by the helplessness of the modern idealism, which ends with the affirmation that all we know about the world is only our sensations, i. e., subjective states of mind. On the other hand, he saw that in spite of those negative results of philosophical investigations the sciences increased their discoveries and human life went farther in its development, based on the belief in the reality of the objective world. Therefore he came to form the opinion that the theory of knowledge was on the wrong path, and that it was just as capable of a positive development as any other of the sciences, if only it rejected its speculative and rationalistic methods. It had only to limit itself to the facts of knowledge, to investigate them in their relations to each other, their development corresponding to the individual environment, and modifications depending upon processes of the physiological states of the organism. His critique of experience is a supreme effort to found such a science. As it is difficult to characterize his methods in a few words, it is proper to give here, as one example, his theory of the fundamental problem of philosophy, namely, the theory of reality. In place of throwing himself immediately into a discussion as to what is reality, Avenarius seeks for other states of the human mind, having much in common with this peculiar state, which induces us to ascribe to certain phenomena the character of reality. He finds three groups of such characters, namely: the characters of existence (which includes the character of reality), the characters of security and the characters of the known (Bekanntheit). He joins them all under the common name of 'Fidencial-charactere,' which characters he considers as depending upon the exercise of the corresponding nervous processes. He explains this by the following examples:

"The exercized value 'Fatherland' is for individuals the conception of something 'existing' in the full sense of the word; and this is more exclusively the case when they spend their lives in the same place; the world at large, of which they have only 'heard' not being in this respect on the same level with their 'fatherland.' The 'fatherland' is at the same time the 'known' place of the earth on which the individual feels himself 'sure;' i. e., the same complex of elements are characterized by 'security' and by being 'known.' Therefore, the 'fatherland,' which is something 'known,' is in addition something 'sure' for its inhabitants, even when its situation was on the shore of the sea, like Halligen, or at the foot of an unquiet mountain, as formerly were Plurs, Goldañ, and now Elm, etc. What follows may serve as an example of the primordial unity of the three characters:

"The 'known' path and guide, the 'known' guide-book and hotel, the 'known' newspaper and authority are also characterized as 'sure' ones. The money of the fatherland is the 'sure' money, because it is 'known,' and the longer it is 'known' the more 'sure' it is."

Then follows an investigation of the transition of the 'Fidencial-charactere' from the *positive* to the *negative* direction, the change from 'familiarity' into 'strangeness.' Each of the

¹P. 30 and following, Vol. II.

three characters of this group can go through a line of diminishing values until it passes into a negation.

"So passes the character of 'existence' (Sein) into 'appearance' (Schein), the character of 'security' into a 'lesser security,' 'the known' (Bekanntheit) into a 'lesser known'; to end in the corresponding negative characters of 'existence,' 'security' or 'the known.' On the way those characters must pass through a point of indifference."

Among the examples, given by Avenarius in such abundance as to form in reality sufficient material for a scientific in-

duction of the laws, are the following:

"Those natures whose 'habits of life' are directed toward the continual exercise of 'realism' in the bad sense of this word, i. e., toward seeking for gain and pleasures, or in pursuing a vicious life, or in crawling and pushing (Kricher und Strebertum); such individuals give the maximum 'existential' values (maximale Existential-Werte) to the corresponding mental processes." -(E Werte, in the terminology of Avenarius). "If they are brought to think upon so-called 'ideal' values by their experiences, or through some communication (Mittheilung), the 'existential' difference appears proportional to the exercise. Selfforgetfulness, simple honesty, purely objective devotion, appear to them as 'less true,' 'less real,' 'more apparent,' and further are characterized as 'untrue,' 'unreal,' 'non-existent.'" "So also the type of 'present,' which is the most exercised in life, possesses the strongest 'existential' characteristics; while the 'past' and the 'future' possess, in a degree corresponding to their dependence upon less exercised processes, smaller existential characteristics; the 'present' is the 'existent,' the 'past' is the 'apparent,' which has lost its 'existence.' The 'future' will yet obtain its 'existence.' This is why the Eleatics could say of their 'being' (Sein) that it neither was nor will be, but only is, that only the unmovable and eternal being is; the 'different,' the 'becoming' (Werdende) and 'passing' is 'apparent."

"As an especial case we obtain the expression: This color under ordinary conditions is dead-black, but on a white background it appears darker."

It is impossible in this place to deal with the whole treatise on the characters of reality. We will add, only as an especially interesting point, that Avenarius considers the *idea* as possessing a character of reality which is in its modifications very near to the zero point, but on the positive side. This plain statement explains in a very simple way some of the most important philosophical misunderstandings.

The theory of knowledge given by Avenarius is, as we can easily see by the above examples, a descriptive one, but at the same time, and, perhaps even because of this fact, it is a general theory of knowledge. While formerly every theory of knowledge sought to explain how our thoughts grasp the 'existing world,' and therefore could be considered as a special theory, deriving from the individual disposition of the author, the theory of Avenarius gives a description of all those special cases of the 'explanation of the world,' and tries to induce the general laws from these facts of knowledge. The whole work is started from this point of view, that the first things given to the human mind are not abstractions, such as sensations, selfconsciousness, etc., but simply things and ideas. Therefore things and ideas should be the starting point of every philosophical investigation of the basis of our knowledge. All that we know consists only of things and ideas relating to them, and modifications of the latter more or less removed from the facts. Consequently everything in human knowledge is in some way an experience, but possessing different degrees of purity. The ideal knowledge is the pure experience which contains nothing but elements relative to the facts given by experience. Science possesses already some general notions of this purely experimental character, as, for example, the notion of energy in physics. But it is the tendency of the whole mass of human knowledge to become pure experience, in other words, to become in the highest degree adapted to the surrounding world. Humanity represents, in the whole, a kind of ultra-human organism, following the same rules of self-preservation, and consequently of adaptation as any individual organism.

This last statement brings us into the very heart of the theory of Avenarius. He considers that every psychical state in living

beings is a result of the self-preservative processes of the organism. Psychical processes accompany the physiological processes of the restoration of equilibrium in living organisms. The elementary physiological processes, consisting of a state of disturbance of the equilibrium of a partial central nervous system, and in restoration of the difference, is called by Avenarius a 'Vital-reihe,' a 'vital train.' Psychical states correlative to these physiological states are called the 'Abhängige Vitalreihe,' 'dependent vital trains.' When the equilibrium of a nervous system is disturbed it is always on account of a difference arising between the nutritive functions of the system and its work. The whole first volume of the theory of experience is devoted to a kind of general biology, describing the laws of the evolution connections, changes, etc., of such 'vital trains' in individual and social organisms. The second volume is a description of the 'dependent vital trains' as single 'psychical states,' and their especial characters, whole trains of thought, and such social products as sciences, religions, ethics, etc., being nothing else than socially developed 'dependent vital trains.' It is the first attempt in modern psychology, so far as I know, to discover the laws of the origin, development and termination of trains of thought; the theory of association explaining only (and then not entirely) the origin of thought. It is impossible to give the whole contents of the 'Kritik der reinen Erfahrung,' which furnishes indeed the outlines of a new philosophical science. The few ideas that we can speak of here can give only a very feeble impression of this, the most concise and many-sided philosophical work which has appeared since the time of the great authors of the past.

The little paper 'Weltbegriff,' which followed in 1891 contains most of the things already known to students of the Critique. It is a rather popular exposition of the chief ideas of the Critique, namely, of the critical realism, which consists in the critical and conscious acceptation of the facts first given to a naïve mind, namely, that the world consists of 'things' and 'ideas,' in opposition to those idealistic theories, which consider the world as 'representation' or 'will,' or 'will and representation,' etc. An especially new point in this paper is the theory

of 'Introjection,' by which Avenarius explains the growth and formation of the theory that a fundamental difference exists between the 'inner' and 'outer' experiences. Avenarius does not find in these two kinds of experience any 'incomparability' or any 'fundamental dualism.' The idea of their essential difference has been derived, according to his opinion, from a kind of false materialism, which believed in the enclosure of the soul in the body or in a part of it, and later, in the enclosure of the faculties of the soul in the soul's substance. From this belief sprang the notion that the soul was something enclosed from the 'outer world,' into which enclosure every impression from without could come only through a putting-in, or 'introjection.' The whole modern psychology, psycho-physics and most of the philosophical theories, contain such opinions and therefore serve to strengthen the artificial wall between the 'inner' and 'outer' experiences which makes the sciences of the 'inner world' always more inaccessible to exact methods of investigation, and consequently more sterile.

Besides these chief works and a few short papers published in magazines, Avenarius was founder and editor, for 21 years, of a quarterly very well known in the philosophical world, namely, 'Vierteljahrschrift für die Wissenschaftliche Philosophie.' This magazine was founded by Avenarius and his friends, in order to develop a philosophy which would not be opposed in its chief statements to the final results of science, but would follow the same way of investigation, and conform to the growth of human experience, as the sciences have done. Among the best known authors who contributed to this journal are: Riehl, Goring, Wundt, Laass, Heinze, Windelband, Paulsen and others.

SOME PRELIMINARY EXPERIMENTS ON VISION WITHOUT INVERSION OF THE RETINAL IMAGE.

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Two important theories of upright vision hold that the inversion of the retinal image is necessary for the perception of things as upright. According to the first, which we may call the projection theory, objects are projected back into space in the directions in which the rays of light fall upon the retina. And the crossing of these lines of direction within the eye requires that if the object is to be projected right side up the retinal image must be inverted. The second theory, which may be termed the eye-movement theory, holds that the movements of the eye and our perception of the direction of such movements are the means by which we judge of the spatial relation of objects in the visual field. Upper and lower, according to this theory, mean positions which require an upward or downward movement of the eye to bring them into clear vision. But an upward movement of the eye brings into clear vision only what lies below the fovea on the retina. So that here too the perception of objects as upright requires that their retinal images be inverted.

The purpose of the experiments, of which only the preliminary ones are here reported, was to throw some light, if possible, on the correctness of this assumption. Is the inverted image a necessary condition of our seeing things in an upright position? The method of approaching the problem was to substitute an upright retinal image for the normal inverted one and watch the result.

This was done by binding on the eyes a simple optical con-

¹Read at the Third International Congress for Psychology, Munich, August, 1896.

trivance constructed on the following principle: If two convex lenses of equal refractive power be placed in a tube at a distance from each other equal to the sum of their focal distances, the eye in looking through the tube sees all things inverted, but in other respects the image remains unchanged. The image cast on the retina is as if the whole field of view had been revolved on the line of sight through an angle of 180°. All light other than that which comes through the lenses must, of course, be carefully excluded by making the instrument fit exactly the inequalities of the face by means of black linings and pads. For if light were permitted to enter the eyes otherwise than through the lenses, the observer would be subjected to both upright and inverted images, and the purity of the experiment would be lost.

The size of the visual field was a matter requiring some care. The size and refractive power of the lenses are the determining factors here, and in the desire to obtain a reasonably large visual field one is tempted to use large thick lenses. But they are soon found to be too heavy to wear on the head for a considerable length of time. I found it best, therefore, to modify the instrument above described, by substituting two double convex lenses (placed close together on the same axis line) for each of the lenses in that description. I had thus for each eye a short adjustable tube, and at either end of the tube a pair of good lenses of equal focal length. The instrument by this means gave a clear field of vision with a compass of 45°, and at the same time was light enough to be worn without discomfort.

At first I hoped to use the two eyes together in the experiment; but without automatic convergence of the two tubes the strain in reaching a superposition of the two optic images was found to be too severe. The distress in the eyes made it seem best to experiment on monocular vision alone, which could be done without interfering in the least with the principle or purpose of the research. The lens for the left eye was consequently covered with dull black paper; the eye could then remain open and the disadvantage of bandaging be avoided.

In the preliminary experiment here reported, I bound the instrument on my face at 3 o'clock in the afternoon, and wore it without interruption until 10 o'clock in the evening. The in-

strument was then removed, with closed eyes; the latter were thoroughly blindfolded, until with closed eyes again the next morning the apparatus was replaced in position. From 9:30 in the morning until about 10 o'clock in the evening of this second day, the instrument was again worn continuously, and then the eyes blindfolded as before. The third day the instrument was worn from 10 o'clock in the morning until noon, and then removed. The time during which the experience under the artificial conditions actually lasted—the total time less that in which the eyes were blindfolded—was therefore about 21 ½ hours—a time, of course, altogether too short from which to expect very pronounced results in undoing a life-long habit of interpreting visual signs, but which, nevertheless, gave interesting indications of what would result if such an experience were considerably extended.

The time was spent entirely indoors, watching the scene on the street below, watching the movements of my feet and hands, experimenting on the changes which occurred in the visual field in connection with particular movements of the head or of the whole body, grasping and handling seen objects—in short, trying to crowd as varied an experience as possible into the brief

time at my disposal.

The course of experience was something as follows: All images at first appeared to be inverted; the room and all in it seemed upside down. The hands when stretched out from below into the visual field seemed to enter from above. Yet although all these images were clear and definite, they did not at first seem to be real things, like the things we see in normal vision, but they seemed to be misplaced, false, or illusory images between the observer and the objects or things themselves. For the memory-images brought over from normal vision still continued to be the standard and criterion of reality. The present perceptions were for some time translated involuntarily into the language of normal vision; the present visual perceptions were used simply as signs to determine how and where the object would appear if it could be seen with restored normal vision. Things were thus seen in one way and thought of in a far different way. This held true also of my body. For

the parts of my body were *felt* to lie where they would have appeared had the instrument been removed; they were *seen* to be in another position. But the older tactual and visual localization was still the *real* localization.

All movements of the body at this time were awkward, uncertain, and full of surprises. Only when the movement was made regardless of visual images, by aid of touch and memory alone-as when one moves in the dark-could walking or movements of the hand be performed with reasonable security and directness. Otherwise the movement was a series of errors and attempts at correction, until the limb was finally brought into the desired position in the visual field. The reason for this seems partly to have been that the reconstruction of the visual field in terms of the normal visual experience—the translation before spoken of—was never carried out in all the details of the picture. In general, or in the main outlines, things might be referred to the positions they would have in normal vision, but the new visual field was in many of its details accepted just as found, and was acted upon without any translation whatever. So that when movements were made as if the visual signs meant just what they had meant in normal vision, the movements of course went astray. The limb usually started in the opposite direction from the one really desired. Or when I saw an object near one of my hands and wished to grasp it with that hand, the other hand was the one I moved. The mistake was then seen, and by trial, observation, and correction, the desired movement was at last brought about.

As I moved about in the room, the movement of the visual images of my hands or feet were at first not used, as in normal vision, to decide what tactual sensations were to be expected. Knocks against things in plain sight were more or less of a surprise. I felt my hand to be in a different position from that in which I saw it, and could not, except by cool deliberation, use its visual image as a sign of impending tactual experience. After a time, however, repeated experience made this use of the visual image much less strange; it began to be the common guide and means of anticipation. I watched my feet in walking, and saw what they were approaching, and expected visual and

tactual contact to be reported perceptionally together. In this way the limbs began actually to feel in the place where the new visual perception reported them to be. The vivid connection of tactual and visual perceptions began to take away the overpowering force of the localization lasting over from normal vision. The seen images thus became real things just as in normal sight. I could at length feel my feet strike against the seen floor, although the floor was seen on the opposite side of the field of vision from that to which at the beginning of the experiment I had referred these tactual sensations. I could likewise at times feel that my arms lay between my head and this new position of the feet; shoulders and head, however, which under the circumstances could never be directly seen, kept the old localization they had had in normal vision, in spite of the logical difficulty that the shape of the body and the localization of hands and feet just mentioned made such a localization of the shoulders absurd.

Objects lying at the moment outside the visual field (things at the side of the observer, for example) were at first mentally represented as they would have appeared in normal vision. As soon as the actual presentation vanished, the new relations gave way to the old ones brought over from the long former experience. The actual present perception remained in this way entirely isolated and out of harmony with the larger whole made up by representation. But later I found myself bringing the representation of unseen objects into harmonious relation with the present perception. They began now to be represented not as they would appear if normal vision were restored, but as they would appear if the present field of vision were widened or moved so as to include them. In this way the room began to make a whole once more, floor and walls and the prominent objects in the room getting into a constant relation to one another, so that during a movement of the head I could more or less accurately anticipate the order in which things would enter the visual field. For at first the visual search for an object outside of the immediate sight was quite haphazard; movements were made at random until the desired object appeared in sight and was recognized. But now the various lines of visual direction and what they would lead to were more successfully held in mind. By the third day things had thus been interconnected into a whole by piecing together the parts of the ever-changing visual fields.

As to the relation of the visual field to the observer, the feeling that the field was upside down remained in general throughout the experiment. At times, however, there were peculiar variations in this feeling according to the mental attitude of the observer toward the present scene. If the attention was directed mainly inward, and things were viewed only in indirect attention, they seemed clearly to be inverted. But when, on the other hand, full attention was given to the outer objects, these frequently seemed to be in normal position, and whatever there was of abnormality seemed to lie in myself, as if head and shoulders were inverted and I were viewing objects from that position, as boys sometimes do from between their legs. At other times the inversion seemed confined to the face or eyes alone.

On removing the glasses on the third day, there was no peculiar experience. Normal vision was restored instantaneously and without any disturbance in the natural appearance or position of objects.

The experiment was of course not carried far enough to see the final aspect the experience under these conditions would assume. But the changes which actually occurred, even the transitory feelings the observer at times had, give hints of the course a longer experiment of this kind would take. I might almost say that the main problem—that of the importance of the inversion of the retinal image for upright vision-had received from the experiment a full solution. For if the inversion of the retinal image were absolutely necessary for upright vision, as both the projection theory and the eye-movement theory hold, it is certainly difficult to understand how the scene as a whole could even temporarily have appeared upright when the retinal image was not inverted. As was said, all things which under the conditions could be seen at all repeatedly appeared to be in normal relation; that is, they seemed to be right side up. Only certain parts of the experience (i. e., head and shoulders), upon which under the circumstances vision could give no report at all.

because these parts could not be brought directly into the visual field, seemed to be in abnormal relation to the scene. That these parts of the body should have stubbornly refused to come into harmony with the new arrangement is easy to explain. The only visual experience I had had of them was the normal visual experience, and this remained firm in memory without the possibility of displacing it by repeated contradictory visual perception under the new conditions. But of those parts of the body which could be seen, the new appearance and localization was able to drive the old from the field, because the new localization by sight showed a perfect and constant relation to the reports by muscular and tactual perception. No doubt the merely tactual experience of the unseen parts of the body and of their relation to the seen parts must inevitably have produced in time a new indirect visual representation of these unseen parts which would displace the older representation brought over from normal vis-The gradual organization of the whole experience would certainly produce this result, although it would undoubtedly require more time in the case of the unseen parts of the body than in that of the parts plainly visible.

In fact, the difficulty of seeing things upright by means of upright retinal images seems to consist solely in the resistance offered by the long-established previous experience. There is certainly no peculiar inherent difficulty arising from the new conditions themselves. If no previous experience had been stored up to stand in opposition to the new perceptions, it would be absurd to suppose that the visual perceptions in such a case would seem inverted. Any visual field in which the relations of the seen parts to one another would always correspond to the relations found by touch and muscular movement would give us 'upright' vision, whether the optic image lay upright, inverted, or at any intermediate angle whatever on the retina. Only after a set of relations and perceptions had become organized into a norm could something enter which was in unusual relation to this organized whole and be (for instance) upside down. But a person whose vision had from the very beginning been under the conditions we have in the present experiment artificially produced, could never possibly feel that such visual perceptions were inverted.

PHYSICAL AND MENTAL MEASUREMENTS OF THE STUDENTS OF COLUMBIA UNIVERSITY.

BY PROFESSOR J. McKEEN CATTELL AND DR. LIVINGSTON FARRAND.

Extended measurements have been published of certain traits of soldiers, of school children and of the defective classes, more especially of their height, weight, eyesight and defects of body. Single tests of a psychological character have been made on school children and on groups of adults, and we have the many researches from our psychological laboratories giving the results of experiments on a few individuals. As it is not our object to give a detailed historical sketch¹ of the statistics and experiments hitherto published it will suffice to refer espe-

¹There have been at least four series of mental tests proposed in which methods have been discussed without the communication of results: 'Mental Tests and Measurements': J. McK. Cattell, with an appendix by Francis Galton, Mind, 1890; 'Zur Individual Psychologie': Hugo Münsterberg, Centralblatt f. Nervenheilkunde und Psychiatrie, 1891; 'Der Psychologische Versuch in der Psychiatrie': Emil Kraepelin, Psychologische Arbeiten, 1895; and 'La Psychologie Individuelle': A. Binet et V. Henri, L'Année psychologique, 1896. One of the present writers was perhaps the first (1885 and subsequently) to publish experiments on individual psychology made in the laboratory, its introduction having, probably, been delayed because Professor Wundt was not favorable to it. Recently the individual variation in some special psycho-physical or mental trait has been frequently investigated. This has been encouraged by Galton in England (to whom we owe the method of the questionnaire), by Kraepelin in Germany, and by Binet in France, but by far the most numerous contributions to the subject have come from American Laboratories-Harvard, Yale, Clark, Columbia, Princeton, Pennsylvania, Chicago, Cornell, Wisconsin and others. Two papers which describe several tests made on a number of individuals deserve special mention in connection with this paper: 'Experimentelle Studien zur Individual Psychologie: A. Oehrn; Dissertation (under Kraepelin), Dorpat, 1889, reprinted with slight alterations, Psychologische Arbeiten, 1895; and 'Researches on the Mental and Physical Development of School Children': J. A. Gilbert, Studies from the Yale Laboratory, 1895, reported also by E. W. Scripture. Zeitschrift f. Psychologie, etc., X, 1896, and THE PSYCHOLOGICAL REVIEW, III, 1896.

cially to the two undertakings most similar to our own. Mr. Francis Galton recommended in 1882¹ the establishment of anthropometric laboratories, and subsequently carried his plan into effect by placing a laboratory in the South Kensington Museum, London, which was continued until last year, when the apparatus was removed to the Clarenden Museum, at Oxford. Visitors could there have certain tests made on payment of a small fee. The tests included, in addition to several purely physical measurements, keenness of eyesight and hearing, color-sense and highest audible note, dynamometer pressure, reaction-time and errors in dividing a line and angles. At the World's Columbian Exposition, Chicago, 1893, Professor Joseph Jastrow arranged a psychological laboratory in which a considerable number of tests strictly psychological in character were undertaken.

The early publication of the results obtained by Mr. Galton² and by Prof. Jastrow may be expected, but without awaiting these we shall proceed with the description of our work. We are lead to do this at the present time more especially because at the Philadelphia meeting of the American Psychological Association (December, 1895), a committee, consisting of Professors Cattell, Baldwin, Jastrow, Sanford and Witmer, was appointed to consider the feasibility of cooperation among the various psychological laboratories in the collection of mental and physical statistics. As a report from this committee is to be expected at the next meeting of the Association, it is desirable that the members have before them such tests as have already been made. It may also be mentioned that at the meeting of the American Association for the Advancement of Science (Buffalo, August, 1896), a standing committee, consisting of Messrs. Brinton, Cattell, McGee, Newell and Boas, was appointed to organize an ethnographic survey of the white race in the United States. It is important that psychological tests be included in

¹Fortnightly Review; cf. also Inquiries into Human Faculty, London, 1883.
² Since the above was written, Mr. Galton has informed one of the writers that the people who came to his laboratory were so mixed that no homogeneous group can be extracted out of them that is both large and interesting. Still it is to be hoped that the large mass of data collected under Mr. Galton's direction will be published.

this survey, and that the work be coördinated with that proposed by the Psychological Association.

One of the present writers began the collection of physical and mental measurements of students of Cambridge University, the University of Pennsylvania and Bryn Mawr College in 1887–8, and some description of the tests was published in 1890 (op. cit.). The methods have been gradually revised and we shall confine our present account to experiments made on students of Columbia University in 1894–5 and 1895–6. These have been described by Prof. Cattell before the New York Academy of Sciences, May, 1895, and the American Association for the Advancement of Science, August, 1896, and by Dr. Farrand before the American Psychological Association, December, 1895.

Our chief object in the present paper is the description and discussion of methods rather than the communication of results, but we give the averages secured from 100 students. This is a comparatively small number, but it suffices for our present purposes. For the study of the distribution of variations extended statistics are needed, but in that case it would not be necessary to make a large number of different tests. The average of a group of 100 homogeneous individuals has a relatively small probable error, and suffices to determine the place of the individual in the group and for the comparison of this group with other groups. Differences that can be established as the result of 100 measurements should be investigated before we undertake the study of minor or inconstant deviations. The 100 measurements at our disposal cannot, however, be subdivided, and about 1.000 measurements will be needed in order to arrive at the end we have more especially in view, namely, the study of the development and correlation of mental and physical traits. We want to know how a man who has, for example, a large head, a short reaction-time or a good memory, is likely to vary from the average in other directions, and how likely he is to vary to a certain extent. As in other scientific work these tests have two chief ends, the one genetic, the other quantitative. We wish to study

growth as dependent on environment and heredity, and the correlation of traits from the point of view of exact science.

Before proceeding with this difficult undertaking it is necessary to learn what tests are the most typical and useful, and what methods are the best and most feasible. It is important that coöperation be secured in deciding what tests shall be used, and in studying and eliminating the numerous drawbacks and sources of error. We do not regard it as necessary or desirable that each laboratory should undertake the same tests. It would, however, be useful to select a few tests made in exactly the same manner, and for different investigators to undertake to extend the measurements in the direction in which they are most interested.

We give on the following page a reduced (the original sheet apart from the margin is about 23 x 18 cm.) fac-simile of the blank used in recording our tests from which their general character may be seen. The tests can only be made individually, one recorder having charge of one student, and, unless the apparatus is duplicated, only three or four records can be made simultaneously. It is consequently essential that the tests should be such that the records can be taken quickly. Our series contains 10 records and 26 measurements (several consisting of from two to five separate determinations), which can be completed in from 40 min. to one hour, varying within these limits according to the skill of the recorder, the intelligence of the student and the degree in which the apparatus is in order.

In selecting the tests, the time required to make them must be especially considered, and some attention should also be paid to the time taken in collating the results. The student would, in nearly all cases, be willing to submit to a longer examination, but this requires a considerable expenditure of time on the part of a skilled observer. Our object has been to form a series that can be made within one hour, and but little can be added to this series without omitting something to make place for it. We suggest below several additional tests of psychological interest, for which time might be found when the series is made

Laboratory of Psychology of Columbia College, Physical and Mental Tests.

Name	:422244444444	Da	te of Birth	***************************************	00++000++=================
Birthplace		of father	of	mother	
Class	**********	Profession of	f father	***********	
Color of eyes		of	hair	*****************	***************************************
Perception of size		Memo	ry for size.	***********	20202000000000000000000000000000000000
Height					
Breathing capacity	1 2	Size of head	00044440444044	Right har	nded ?
Strength of hand, ri	ght { 1		Left { 1		*******************
Keenness of sight, r	ight eye		Left	*************	
Keenness of hearing	g, right ear		Left	*****************	
Reaction-time	ī	3	*******************************	***************************************	
After-images					
Color vision		Perception	n of pitch.	****************	*************
Perception of weight					
Sensitiveness to pair	right hand	1	Preference :	for color	***************
			- 1		3
Perception of time					
Accuracy of moveme		17			
Memory	***************			***************	****************
Imagery	**********************	N 02000111111111111111111111111111111111	****************	***************	
Are you willing to	repeat these t	ests at the en	d of the So	phomore a	and Senior
years ?Do	you wish to h	ave a copy of	these tests	sent you?	***************************************
Date of measurement		Reco	orded by	*************	

under favorable conditions. It might be desirable to place at the end several tests (we have done this in the case of *mental imagery*), which could be made or omitted as time might require. We give below additional observations which can be made by the recorder without much expenditure of time, and a series of questions which can be answered by the student at home.

We fully appreciate the force of the arguments urged by Professor Münsterberg and by MM. Binet and Henri in favor of making tests of a strictly psychological character. For the psychologist these are, of course, the most interesting and important. But we are at present concerned with anthropometric work, and measurements of the body and of the senses come as completely within our scope as the higher mental processes. We can determine in thirty seconds whether or not a man is color-blind, and thus secure a fact of great personal interest to him, and a typical and sharp variation which can be studied in relation to other traits. If we undertake to study attention or suggestibility we find it difficult to measure definitely a definite thing. We have a complex problem still requiring much research in the laboratory and careful analyses before the results can be interpreted, and, indeed, before suitable tests can be devised.

In addition to the writers several graduate students acted as recorders. A large number of records were taken by Mr. Franz, fellow in psychology, and by Mr. Houston, scholar in psychology, and some records were taken by Mr. McWhood, now fellow in psychology, by Mr. Lay, lately fellow in philosophy, by Mr. Schneider, lately fellow in botany, and by Mr. Kingham. All the recorders had had training in making the tests, but it must be remembered that the results depend somewhat on the methods used by the recorder, and it would be desirable to collate the results for the different recorders and to have the same students tested by different recorders, in order to learn what variations may be due to this source. The methods should be, as far as possible, automatic, and it would perhaps be best to let the recorder read written instructions to the student. Still a certain amount of latitude is inevitable, as students vary greatly in the quickness with which they understand what is to be done.

The attempt was made to follow the order given on the blank (except that memory for size was tested at the end), but this could not be done exactly when 2 or 3 students were tested simultaneously. It would, however, be desirable to test all observers in exactly the same order, as some skill is acquired in the course of the experiments. The five rooms of the laboratory were used, and we tried to leave the student alone with the recorder in cases where the test depended on the attention.

We requested the Freshmen of the School of Arts and of the School of Mines to come by appointment. About one-half of them came, and all were interested in the tests and agreed without hesitation to repeat them at the end of the Sophomore and Senior years. The repetition of the tests will be one of the best criteria of their validity, and we hope the results will be of interest in showing the development of the student during his college course, more especially when taken in connection with the nature of his course, his standing in his studies, etc.

The 100 records used were taken alphabetically, none being omitted. They include 60 Freshmen from the School of Arts, 20 Freshmen from the School of Mines and 20 more advanced students. The records were arranged for these groups alphabetically in sets of ten, and the individual variation from the average of each set calculated. Then the average variation of the sets of 10 from the average of the 100 records was taken. We give these two variations in addition to the average, denoting them by v and V, respectively. We have not omitted any record unless it seemed to contain an error on the part of the recorder. In a few cases tests were omitted by accident, and certain of the tests were added the second year, it being found that more could be made within the hour than we had expected. Some of the sets thus contain less than ten records, the total number made in the group being given.

We shall not at present undertake to discuss in detail the distribution of the deviations, or whether the average, or the median, or the limits within which a certain percentage of the records fall, is the best standard. When the records are arranged in small groups the average is most convenient. If an individual varies from the group by an amount not more than the average

variation he may be regarded as normal. This would include about one-half of the students. Those coming above may be regarded as hyper-normal and those coming below as subnormal. The best method of adjusting the observations must be worked out with a larger mass of material than we have as yet at our disposal.

- We shall now proceed to the discussion of the separate tests.

PRELIMINARY DATA.

The student was required to write his own name, the date of his birth, his birthplace and the birthplaces of his parents, the profession of his father, his class and course in college.

Handwriting. It is desirable to let the student write in ink his own name and the other data. 'Graphology' has fallen into disrepute because too much has been asked of it. The handwriting, however, is certainly characteristic of the individual and may prove interesting when collated with the other tests. But we are not prepared to communicate any results based upon our present data.

Age. The average age of the Freshmen, School of Arts (59 cases), in their first term was 18. The age of our college students has often been discussed and our records are of value only in connection with subsequent tests. It may be worth while to call the attention of those who compare statistics of the age of students to the fact that while there are no students whose age is considerably below the average there are sometimes a few older men in the class. For most purposes it would consequently be better to use the median than the average. There were no men over 23 among the Columbia Freshmen, and it appears that the average age is younger than at Harvard or Yale.

Birthplace. The nationality was, in percentages (which are also the actual numbers), as follows:

	Student.	Father.	Mother.
North America,	94	64	81
New York City,	(29)	(10)	(17)
Foreign,	5	34	17
German,	(2)	(20)	(7)
Irish,	(0)	(5)	(2)
English,	(1)	(5)	(2)
Not Given,	x	2	2

As we have already stated all our data have their chief interest in their correlations with the others, and we shall not be able to work out these relations for some years. It will, for example, be of interest to compare the physical and mental traits of students of American parentage with those of German or of English parentage and to study the effects of heredity and environment. For this purpose it would undoubtedly be desirable to record the nationality of at least the grandparents (see the supplementary set of questions given below). We may, however, call attention to the large percentage of foreign parents, especially of fathers. It is a characteristic sexual difference that twice as many men as women should have emigrated.

The profession of the fathers was as follows:

Business,		56
Profession,		26
Lawyers,	(6)	
Physicians,	(6)	
Clergymen,	(4)	
Farmers,		3
No Calling,		1
Not Given,		14

A majority of the students of Columbia University come from the business classes, and the father in most cases did not have a college education.

Supplementary data. Further details regarding the heredity, interests, habits and condition of the student, such as he himself could give or such as could be secured from the impressions of the recorder would undoubtedly add greatly to the value of these tests. The limitations are due to the need of completing the series within one hour and additional records should not lengthen this time.

We suggest the two following series of records, the first of which should be filled up by the recorder and not seen by the student, while the second blank should be given to the student to be filled up at his convenience at home and returned in an addressed envelope. These series are only provisional, and have not as yet been used by us. We shall, however, use them this year, and should be glad to have suggestions regarding them.

SUPPLEMENTARY OBSERVATIONS BY THE RECORDER.

[To be filled in while the student is writing his name.].

```
What is his apparent age? ( ), 17 ( ), 18 ( ), 19 ( ), 20 ( ), ( ).

Is his apparent state of health good ( ), medium ( ), poor ( )?

Is he tall ( ), medium ( ), short ( )?

Is his head large ( ), medium ( ), small ( )?

Do you think his physical development good ( ), medium ( ), poor ( )?

Do you think him likely to be as a student good ( ), medium ( ), poor ( )?

In these mental tests do you think him likely to be good ( ), medium ( ), poor ( )?
```

[To be filled in during or after the tests.]

```
Hair: dark ( ), medium (
                                           ), light (
                             ), medium ( ), light (
Complexion: dark (
Complexion: clear (
                                ), medium (
                                                      ), blotched (
Eyes: dark ( ), medium ( ), light ( )?

Hair: straight ( ), wavy ( ), curly ( )?

Nose: convex ( ), straight ( ), concave ( )?
Elevation of nose: high ( ), medium ( ), low ( )?

Ears: large ( ), medium ( ), small ( )?
Ears: projecting ( ), medium ( ), close (
Mouth: large ( ), medium ( ), small ( )
Lips: thick ( ), medium ( ), thin ( )?
                                                                   ), medium (
Hands: (in relation to size of body,) large (
  ) }
                                                                    ), medium (
Fingers: (in relation to width of hand), long (
                                                                                          ), short
```

Face and Head: note symmetry or asymmetry, also any abnormality as malformation of ears, squint, etc.

[To be filled in after the tests have been completed. The recorder is expected to use any suggestions that he may obtain from having made the records, but not to examine these with a view to using the information.]

Do you think his state of health good (), medium (), poor ()?

Do you think his physical development good (), medium (), poor ()?
Do you think him likely to be as a student good (), medium (), poor
()?
Do you think that in the mental tests he has done well (), fairly (),
poorly ()?
In understanding what was wanted, was he quick (), medium (),
slow ()?
Was he talkative (), medium (), quiet ()?
Do you judge him to be accurate (), medium () not accurate ()?
Do you judge him to be straightforward (), medium (), not straight-
forward ()?
Do you judge him to be intellectual (), medium (), not intellectual
()?
Do you judge his will to be strong (), medium (), weak ()?
Do you judge his emotions to be strong (), medium (), weak ()?
Would you call him well-balanced (), medium (), not well-balanced
()?
Would you call his temperament choleric (), sanguine (), melan-
cholic (), phlegmatic ()?
Name,
Recorded by,
Date,

SUPPLEMENTARY DATA TO BE FILLED IN BY THE STUDENT.

[Place a check (\checkmark) in the proper parenthesis; use a question mark (?) when you are unable to answer a question or would prefer not to do so. If you can only answer a question approximately do so and add ca.]

1	Father.	Mother.	Paternal Grandfather.	Paternal Grandmother.	Maternal Grandfather.	Maternal Grandmother.
Living? (if so, give age),	l'illi					
Deceased? (if so, give year of death and age at time of death)						
Cause of death, if deceased					1	
Most serious diseases from which they have suffered.				1	100	

	1	2	3	4	5	6	etc.
Your mother's born deceased			12				

[Write B for brother and S for sister in the order of age and in the proper column. Include yourself designated by X. After B, S or X write date of birth thus, B. Feb. 10, '84. In case any brothers or sisters have died, write date of death after 'deceased.']

How many brothers did your father have? (), how many sisters? (), was your father his mother's 1st (), 2d (), 3d (), 4th (), 5th (), 6th () or what () child? How many brothers did your mother have? (), how many sisters?), was your mother her mother's 1st (), 2d (), 3d (), 4th

), 5th (), 6th (), or what () child?

[In answering questions such as this one, think of the people you know as in three classes equal in number and decide to which class you belong.]

), medium (), not good Do you regard your general health as good () ?

Do you regard your present health as better than usual (), same as usual (), not as good as usual ()?

Indicate such of the following diseases as you have had by writing in the parenthesis the approximate age at which you had them: convulsions in childhood (), measles (), diphtheria (), scarlet fever (), pneumonia), brain fever (meningitis) (), malaria (), nervous prostration (neurasthenia) ().

Do you have headaches often (), seldom (), never ()?

Do you have colds often (), seldom (), never (Are your teeth good (), medium (), poor ()?

Have you consulted an oculist? (), If so, at what age for the first time?), Do you wear glasses? (), Give the nature of the defect if you know

How many hours do you usually sleep ()?

Do you dream much (), little (), never ()?

Are your dreams as a rule pleasant (), commonplace ()?

As a child were you subject to bad dreams which you have since outgrown?

Is your appetite good (), medium (), poor (

At what time of day do you feel in the best spirits? (At what time of day can you study best? (

Do you drink coffee (), tea ()? If so, how many cups daily, coffee), tea ()? At what age did you begin? ().

Do you smoke? (). If so, how many pipes (), cigars (cigarettes daily ()? At what age did you begin? ().

Do you use alcoholic drinks? (). If so, occasionally (), daily
()? If daily, how many glasses	of beer (), wine (), spirits ();
About how many hours or minute	es daily on the average during the month
of October do you spend in study (), in reading books other than text and
reference books (), in playing se	dentary games (), in playing athletic
	se, as walking, riding a bicycle, etc. ()
	ent? (), if so, what one or ones;
	? (), what musical instrument do you
prefer to hear played? (), which opera that you have heard do
you prefer? ().	
What novelist do you prefer? (), what poet? (),
what painter? (), what play that you have seen acted?
().	
Supposing the following ten ways	of spending an hour give to you pleasure,
write numbers after them in the order	of amount of pleasure they give. Eating
dinner (), playing your favorite a	thletic game (), playing your favorite
sedentary game (), working with	n tools as in a garden (), reading a
	talking to a friend (), day dreaming
(), learning something (), w	riting something ()?
What profession or business do you	a propose to follow? (),
in what calling would you prefer to su	acceed if you had your choice? ().
Send with this, if possible, your m	nost recent photograph (with date at which
it was taken,) and if you have them,	or can have them taken, send photographs
both in full face and in profile.	
Name, (in full)	***************************************
Date of Birth,	Place of Birth,
Class and Course in College,	

PHYSICAL CHARACTERS.

The colors of the hair and of the eyes were recorded with the results given below. The figures are both percentages and actual numbers.

Hair.		Eyes.	
Black,	8	Gray,	33
Dark brown,	56	Blue,	30
Light brown,	34	Brown,	31
Flaxen,	1	Green,	1
Red,	0	Not given,	5
Not given.	1		110

In making these records it would be well to confine the designations to those given above, and it would be an advantage

to have standards by which the recorder could make the comparison. A lock of the hair might be preserved with the record. Unless the recorder has been carefully trained such descriptions do not have great value. The same eyes may be called gray, blue and brown, respectively, by different recorders. In a population so mixed as that of New York City, it is questionable how far these records are of use. If taken at all the description should be made more complete by giving the traits enumerated in the supplementary blank printed above. The finger prints could be taken for purposes of identification.

Height and weight can be measured with comparative ease. We had a Fairbanks' scale with an upright adjustable measuring rod graduated for the metric system. The averages give:

	Av.	v.	v.
Height in cm.	175.1	4-9	1.7
Weight in kg.	66.2	6.0	1.7

Both height and weight are above the average of the population and above the averages for the freshmen entering Yale University.

It so happens that the subdivisions of the metric system are not well suited for these measurements. It is not quite accurate enough to measure to kilograms and centimeters, whereas to measure to tenths of these, especially in the case of weight, is needlessly exact. In these measurements the weight was taken in ordinary indoor clothing, and the height of the heel was subtracted. The record should be written, e. g., 162.7 cm. — 1.4 cm. = 161.3 cm. In some cases the height of the heel was not subtracted, and the average given above is slightly too large.

The size of the head was measured with the conformateur used by hatters. This was placed horizontally above the temples, giving approximately the largest horizontal area of the head. The diameters are given below together with the ratio of length to breadth.

¹ Such standards are sold by the Cambridge Scientific Instrument Co., but at a very high price.

	Av.	v.	V.
Length in cm.	19.3	0.5	0.2
Breadth,	14.9	0.4	0.1

The measurements are not sufficiently accurate to study growth, but would serve for comparison with the other data. The method has the advantage of being easily carried out and leaving a permanent record. It also measures irregularities in the shape of the head that would not be shown by the perimeter. There is a slight inaccuracy owing to the hair being included in the measurement, and a more serious one in the difficulty of placing the instrument in the proper position. This latter difficulty indeed holds for all measurements of the head which can only be made with exactness by a skillful observer.

On the whole we think the conformateur in its present form is less accurate and (in the subsequent calculations) more troublesome than the perimeter and expect hereafter to use the

latter instrument.

The breathing capacity was measured with a fluid spirometer, two tests being taken, the averages in liters (98 cases)

In a determination such as this it is desirable to take two records, as one, especially the first, is sometimes faulty. We think it best to record both measurements, but to use not the average, but the maximum. The averages of the maxima are:

The maximum of the two trials is thus 0.1 liter greater than the average. If time permit it would be desirable to continue a test such as this until the maximum has been reached. If on a sufficient number of observers a larger series of trials were made we could determine how likely it is that the maximum be reached in the first trial, the first two trials, etc.

In addition to these measurements Mr. Galton proposes taking the span of the arms, the height sitting, the height to the

top of the knee, the length from elbow to finger-tip and the length of the middle finger of the left hand. These measurements would probably prove useful for purposes of identification, but do not seem otherwise advisable unless a more thorough physical examination is undertaken than that proposed by Mr. Galton.

It would indeed be highly desirable to make a thorough physical examination, but for this purpose the recorder would need some special training. The most important tests would be of heart (including pulse tracing), lungs (including rate and tracing of breathing), temperature and urine which could be made in a few minutes by a practiced physician. There are many other physical data, such as deformities, peculiarities, stigmata, tendon reflexes, etc., which it would be desirable to have, and we may hope that coöperation between physicians, students of criminology and of the defective classes and those interested in anthropometry may be obtained to select the most important determinations and devise the best means for carrying them out.

VISION.

Color blindness was tested by letting the observer select the four green shades from the woolen skeins supplied by the Cambridge Scientific Instrument Company in accordance with Mr. Galton's instructions. Three per cent. of those tested (71 cases) were color blind and three per cent. appeared to have defective color vision.

The method of selecting colors suffices to show whether or not color vision is normal, if the recorder have sufficient skill to note hesitation on the part of the student. In the case of those color blind or having defective color vision it would of course be desirable to investigate more carefully the nature of the defect.

The Galton instrument is needlessly expensive, as the yarns could be matched for a few cents. If the instrument is used the four pointers should be removed, as the observer should not know that he is expected to find just four shades of green.

Keenness of sight was tested with Mr. Galton's instrument. This gives the distance in cm. at which diamond numerals can be read by each eye singly. We made the test in a room lit only by an electric lamp of 100 candles at a distance of 1 m. from the type. We determined the distance at which at least 8 letters out of 10 could be correctly read, making sure that all letters could be read on the card one step nearer. The percentages (94 cases) for the different distances and for each eye are:

Distance in cm.	Right Eye.	Left Eye.
72	1.06 %	2.02 %
61	29.9	16.00
52	26.6	29.80
44	18.09	31.99
37	10.64	7-49
31	6.38	7.49
26	3.19	3.19
22	1.06	. 0.
19	1.06	0.
16	2.02	2.02

The right eye is thus better than the left, the 'normal' for the right eye being a distance of about 52-61 cm., and for the left eye of 44-52 cm., or a little more.

It is perhaps a needless precaution to use a dark room and standard illumination, but we have found great variations when test-types are illuminated by ordinary daylight. Test-types of varying size at a distance of 5 or 6 m. will do as well as small type at varying distances, but it is easier to have a selection of lines in small type than in large and to expose them for a fairly constant time while the observer is in ignorance of their nature. The tests used by oculists are as a rule defective from a scientific standpoint. The near as well as the far limit ought perhaps to be taken and astigmatism tested.

The test in any case is not very exact, but perhaps as good as any that can be made quickly. It would, however, be desirable to compare various methods, such as counting dots placed at a distance, or drawing a series of figures, and determine which gives the most accurate results in the least time. The test requires atropin to be accurate and an objective examination of the eye such as can only be carried out by a skilled oculist.

It is, however, a great advantage for the student to know whether his eyesight is normal, sub-normal or abnormal, and, if desired, a more careful determination of the nature and amount of the defect can be made either in the laboratory or in the office of an oculist.

The least light visible cannot be readily measured owing to the variations accompanying adaptation; and the least noticeable difference in intensity cannot be measured quickly. A series of shades of gray nearly alike can, however, be sorted by the observer on the plan recommended by Mr. Galton for weights. We must, however, admit that the least noticeable difference in intensity cannot be determined in two or three minutes, and that vision is one of the most difficult senses to test.

Preference for color was tested by showing rectangles (about 5×3 cm., the 'golden mean') of the following colors in irregular order on a black field and asking the student which he liked best. The preferences (66 cases) were as follows:

Blue, 34.9 %; red, 22.7; violet, 12.1; yellow, 7.5; green, 6.1; white, 6.1; no preference, 10.6.

The student was asked to define his degree of preference, in four grades, but our data are not sufficient to warrant a discussion of the results.

HEARING.

Hearing was tested by determining the distance at which the ticking of the laboratory stop-watch could be heard with each ear singly. The results (86 cases) were in percentages:

	Normal	Subnormal	Abnormal
Right ear	86	13	X
Left ear	84	13	3

We did not undertake to measure sharpness of hearing exactly as the laboratory was too noisy. There is unfortunately no good method for measuring the intensity of a faint sound, and one cannot do much more than determine whether the hearing is normal, sub-normal or abnormal.

The accuracy of the perception of pitch was determined by giving twice on a monochord the f below the middle c, the observer being required to find the sound by adjusting the bridge which had been in the meanwhile shifted (which should have been done to about c'). The average variation (48 cases) was 7.5 cm. (v, 5.9; V, 1.9) or nearly one whole tone. Of those tested 10% could adjust the monochord within about $\frac{1}{10}$ tone, 61% came between $\frac{1}{10}$ and one tone, and 29% had a greater error.

The observer was not allowed to hum the tone. Perhaps a simpler method would be to strike a key on the piano and let the observer find it. In this case three notes could be struck—high, middle and low. The highest audible note is probably a good test and one not difficult to make.

DERMAL AND MUSCULAR SENSATIONS.

Sensation areas were determined by using an æsthesiometer in which the points were 2 cm. apart, the instrument being applied longitudinally on the back of the left hand between the tendons of the fingers. Five tests were made, the subject being touched with one or two points in the order, 'two, two, one, one, two' and being required to decide in each case whether he were touched with one or with two points. The percentages of the men (49) who were correct a given number of times is as follows:

Correct.	5 times.	16 per cent.
44	4 "	38 "
66	3 "	20 4
64	2 "	22 "
44	1 44	2 "
66	0 "	2 "

The answers were correct in 67% of all the trials, and were correct in 60% of the cases with two points, and in 75% of the cases with one point. It is difficult to determine sensation areas exactly, as there are many sources of error, both in the decision of the student and the way in which the points are applied by the recorder. Perhaps a method of equivalents in which, say, the observer were touched by points 5 cm. apart, and were then required to indicate the distance on the skin, or were touched

and required to touch as nearly as possible the same point, would give more satisfactory results. The data given above determine the sensitiveness of the group, but not of the individual.

The perception of the force of movement was measured by letting the observer make with a dynamometer two pulls in succession as nearly as possible alike, and measuring his error. He was instructed how to make a pull about 4 kg. in strength, and then required to make three pairs of pulls. The average error, from the average of the differences in the three pairs of pulls, was (48 cases):

Av. v. V. Error in kg. 0.63 0.45 0.12

The method of average error always gives results more quickly than the method of right and wrong cases, and it is consequently an advantage to use a dynamometer rather than weights for this test. It is not possible to determine the least perceptible difference in weight by lifting two weights without a large number of experiments. A series of, say, five weights differing by small increments can be arranged in order as suggested by Mr. Galton. In this case, however, it is difficult to find the series that can be just arranged correctly, or to calculate the probable error from the mistakes.

Sensitiveness to pain was determined for the ball of the thumb of the right and left hands. An algometer was used in which the surface applied was of rubber 1 cm. in diameter and rounded at the corners. The instrument was applied with gradually increasing pressure by the student himself or by the recorder (it should be done always by the recorder to secure exactly comparable results), and the student was told to say as soon as the pressure became disagreeable. If he showed signs of discomfort the pressure was stopped. Two tests were made on each hand in alternation, beginning with the right hand. The averages (95 cases) are as follows:

P	ressure in	Kg.	
	Av.	v.	V.
Right Hand,	6.90	2.90	0.96
Left Hand,	6.70	2.64	0.94

The strength of the right and left hands was measured with the ordinary oval dynamometer. Two tests were made with each hand in alternation, beginning with the right hand. The averages (99 cases) of the two trials with each hand are as follows:

Str	ength in K	g.	
	Av.	v.	V.
Right Hand,	38.8	5.7	2.4
Left Hand,	34.6	5.3	2.6

In this test it would save time to make two trials and use the maximum. The dynamometers ordinarily sold are not very accurate, and the amount of pressure measured depends largely on how the instrument is held. We believe the maximum pressure of the thumb and forefinger would be a better test if it could be generally introduced.

Accuracy of movement and tremor were measured by allowing the observer to join two points distant 10 cm., the line being drawn as straight as possible with the free and unsupported hand. The observer was shown at about what rate the movement should be made, the line being drawn in about two seconds. A calculation of the results quantitatively would require much labor, but they could be readily classed for comparison with the other data. Three or five classes could be used, say: straight, medium or crooked; and tremor, much, medium or little.

We think it desirable to add at least one further test of movement and fatigue, and expect this year to try the following: Let the observer make with a spring dynamometer maximum contractions of the thumb and forefinger as rapidly as possible for fifteen seconds. The rate and force of the movements must be recorded on a kymograph. A dynamogenetic test might be added by giving, say, at the end a loud sound and determining its effects on the curve. This experiment would require expen-

sive and complicated apparatus, but there is no special objection to using such apparatus so long as the test itself can be easily and quickly made. The trial should be made with both right and left hands, and perhaps twice, the second record only being used. This determination would make the ordinary dynamometer test unnecessary, except for purposes of comparison.

Professor Jastrow includes a number of other tests on movement. The number of movements that can be made in 15 seconds is a good test, though we think that the one recommended above is better. It can be carried out by tapping a telegraph key and recording the taps on a kymograph. The counting instrument which records the number of pressures made could be used. It is cheap and does get out of order, but the amount of pressure is a variable factor.

The maximum rate of movement is also a valuable test and one easily made after the apparatus is in order. The accuracy with which a movement of given extent can be repeated may be measured, as also the accuracy with which movements can be made in different directions and with the right and left hands. Tremor and involuntary movement can be recorded with the planchette, and the whole field of dynamogenesis offers opportunity for interesting tests if time permit.

TIME MEASUREMENTS.

The reaction-time for sound was measured 5 times in succession with the Hipp chronoscope giving the following results (97 cases):

Time in σ .

Av. v. V.

Reaction-Time. $174(v=29^1)$ 30 13

It is possible that more regular and typical results might be secured if, in place of a sound for stimulus, an electric shock were applied to the fingers with which the reaction is made. Sound is, however, better than light. We do not regard it as desirable to use several senses when time is limited. We be-

¹This variation is the average of the variations of the five reactions made by each observer. In several cases five valid reactions were not recorded.

lieve that the Hipp chronoscope is the most convenient instrument for measuring reaction-times. When once in order it can be used by anyone, and the times are written immediately on the record blank. But the method is immaterial, as it would suffice to measure the times to 0.01 sec. For the well fitted laboratory nothing more suitable than the Hipp chronoscope (in the form in which we use it) can be wanted, but there is urgent need of a simple and portable instrument that will measure times to 0.01 sec. In measuring the reaction-times of an unskilled subject it is not desirable to place him in a separate room, as he must be watched and instructed by the recorder, but a screen should be used to hide the apparatus.

The observer was told to lift (not press, which is a slower and more complex movement) his fingers as quickly as possible after the occurrence of the noise, and was allowed to direct his attention as he found most convenient. It might be desirable to ask the observer after the experiments have been completed as to the direction of attention, but it would scarcely be possible to investigate 'sensory' and 'motor' reactions.

As stated above, we let each observer make five reactions. When all the first reactions, all the second reactions, etc., are averaged together the following results are obtained:

	Time	s in σ.	
	Av.	v.	v.
I	196	55	16
II	178	46	19
III	170	43	16
IV	169	40	19
V	166	35	19
Av.	176	44	18

The first reaction is thus likely to be about 25σ and the second about 10σ longer than the subsequent ones, which show only a slight decrease. To get an observer's reaction-time, therefore, it might be well to make five reactions and use the averages of the last three. The variations, however, show that the first two reactions, though longer, are not more irregular

¹The average of the first reactions is lengthened by two of over 500 σ which were not true reactions and have been excluded from the averages given at the beginning of the section.

than the subsequent ones, and for purposes of comparison the five first reactions can be used.

The reaction-time is one of the tests naturally thought of first in a series such as this, but we do not regard it as one of the most satisfactory. To make reactions quickly and regularly is something of a 'trick' and the variations in time which occur with unpracticed observers depend on complex causes.

Both Prof. Jastrow and Prof. Münsterberg recommend a number of psychometric tests for a limited series such as this. Those used by Prof. Jastrow, which consist of discrimination and choice are even more difficult to carry out and interpret than reaction-times. The results vary greatly with the apparatus used, with the instructions of the recorder and with the attitude of the subject.

The plan first used by one of the present writers of giving lists of colors, words, etc., and measuring the total time required to name them, to form associations, etc., is recommended by Münsterberg and indeed makes up about one-half of his tests. We have used one test of this character, and doubtless others would be useful if time permitted. We gave the observer a blank containing 500 11-point capital letters, of which 100 were A's. Each of the other letters occurred 16 times, and the whole series was arranged in an order drawn by lot. The observer was required to mark as quickly as possible all the A's. We thus have the time (93 cases) required to recognize and mark 100 letters and to discriminate cursorily 400 more.

Time in Secs.

Av. v. V. Marking 100 letters 95.0 12.8 6.4

The average number of A's omitted was 2.6. It was but seldom that a wrong letter was marked. It would be desirable to correlate the rapidity with the number of mistakes. A rough correction could perhaps be made to the rate by adding to the total time the time that would be required to discriminate and mark the letters omitted or wrongly marked. This would increase the average time to about 97.5 seconds, which is very nearly one second per letter. The order of the individuals would

be somewhat changed by such a correction, as there are a few who make a great many mistakes. This itself is typical; some will do a task quickly and well, some quickly and ill, some slowly and well, and some slowly and ill.

If time permit the making of other psychometric tests we should recommend reading as rapidly as possible a list of 100 words, and 100 similar words making sentences; naming 100 (or 20) colors (say red, yellow, green, blue, violet, gray and black, 1 cm. sq. arranged in a chance order on a white ground), which is useful in determining color-blindness as well as quickness of perception and speech, and lastly giving 100 (or fewer) words and requiring the student to write as rapidly as possible the suggested ideas.

This last test would of course be useful in the study of association of ideas, which has not been included in our series. We regret that this has been the case and may try to take up some study of association in our subsequent work. The difficulty is that this subject (like imagery and memory, which we have included), requires more psychological investigation before a test can be conveniently applied and properly interpreted.

PERCEPTION OF SPACE AND TIME.

The observer was given a standard line, 10 cm. in length, drawn near the top of a piece of paper, and was required to place this on the left-hand side of a sheet of letter paper of the same width, and draw in a corresponding position a line of the same length. His line was then folded under and he repeated the trial. The results (93 cases) were:

	Error in mm.		
	Av.	v.	v.
Average Error,	6.5	3-4	0.9

The constant error was on the average + 0.08 mm., that is, there was in the group no appreciable tendency to over-estimate or under-estimate the line.

¹The rate at which a foreign language can be read is a good test of familiarity with the language.

As the sheet of paper was only 20 cm. wide, the observer may have guided himself by the distance from the edge of the paper. It would save time (especially in the subsequent calculations) to make only one trial. We expect hereafter to amplify this test as follows: Give the student a sheet of letter paper (about 25 x 20 cm.) with a line 5 cm. in length drawn horizontally 20 cm. from the bottom of the sheet. The student is required to reproduce this line in the same position on a similar sheet, and afterwards to draw from the middle of the line he has drawn a vertical line of the same apparent length, and then to bisect the left-hand angle and, perhaps, tri-sect the right-hand angle and divide the vertical line in the middle. The test can be made quickly, but it would be somewhat tedious to measure the errors.

The accuracy with which intervals of time can be judged was measured by giving the student an interval of 10 seconds., marked at the beginning and end by taps, and letting him make a tap when an apparently equal interval had elapsed. The results (90 cases) were:

Time in Sec.

Av. v. V.

Average Errors, 1.57 0.81 0.26

The constant error for the group was on the average—0.18 sec. The errors are almost too small to be measured by the method used (an ordinary watch or stop chronoscope), and it would seem desirable either to increase the time to 30 seconds or to use chronographic methods of giving the signals and measuring the times. This test is one easily and quickly made, and strictly psychological in character. But the interpretation of the results is not obvious, and it might perhaps be omitted by those not specially concerned with psychology or amplified by those who are.

MEMORY.

The experiment already described in which we required a student to draw twice a line as nearly as he could the same length as a standard line of 10 cm. was made at the beginning of the series. About three-quarters of an hour later when all the tests had been completed, he was reminded of the line he had drawn and told to draw from memory a line of the same length. We have thus a good test of recollection (the observer not knowing at the time that he would be asked to remember) easily made and giving a quantitative result. The average error of recollection was 7.3 mm. (21 cases only), and the constant error under +0.2 mm., practically none. The error is but slightly larger than in the case of immediate comparison of the lines, but the number of students tested was small.

Like all tests of memory, the results are somewhat complex, and cannot readily be compared with other work not made by exactly the same method. But it is desirable that a test of ordinary or casual memory be made and the conditions fixed by agreement. As in some of the other experiments on our list, the average result of this test gives the accuracy of the class tested, but the place of the individual in the series is very inadequately determined by a single trial.

We also tested immediate memory by reading aloud eight numerals and requiring the student to repeat them, making the determination three times with different numerals. The average number correctly given (without regard to order) was 6.92.

The errors can be counted in three ways, with regard to omissions, substitutions, and mistakes in order or position. It is tedious and difficult to count up the mistakes in order or position, and we give only the total number of numerals remembered. This test can be made in various ways; one can use numerals, letters, words or nonsense syllables, read them or show them, etc. We prefer numerals in spite of the elaborate work with nonsense syllables undertaken by Ebbinghaus and by Müller and Schumann. Jastrow uses additional tests of memory, and it would certainly be desirable to compare auditory and visual memory. It would also be useful to test memory by reading aloud a paragraph (say 200 words) and requiring the student to reproduce it. The experiment is easily made, but it is somewhat difficult to calculate the errors. Perhaps the papers might simply be graded on a scale of 10 with regard to verbal and logical memory.

AFTER-IMAGES AND IMAGERY.

After-images were tested by allowing the observer to see in a dark room for fifteen seconds a white light of determined area and intensity. The area was a cross with arms 1 cm. square, 30 cm. distant from the eyes, and the intensity (light through ground glass which absorbed about one-half) was from a 100 candle power incandescent electric lamp at a distance of 30 cm. Of the 75 students tested 73.3% saw an after-image. The average total duration from the disappearance of the light to the disappearance of the first image, and the duration of the latent period before any image appeared, were as follows:

	Av.	v.	v.
Duration of image in secs.,	44.2	25.2	3.0
Duration of latent period (34 cases),	16.2	9.4	0.2

The latent period is long because the student is not likely to notice the first positive image and oscillations. With 61.8% of the students the after-image, after disappearing, reappeared. With 29.1% it appeared three or more times; with 7.3% four or more times, and with 3.8% five times. The after-image, when first seen, was sometimes positive and sometimes negative, and the colors varied greatly, being distributed in the first phase noticed as follows:

Negative or dark, 33.3%; light or white, 29.4: blue, 13.7; purple, 9.8; green, 5.9; yellow, 3.9: red, 2.0; miscellaneous, 2.0.

We included after-images in our series in part because it was a subject being especially investigated in the laboratory. We think it an advantage for each laboratory to undertake, in addition to certain tests made everywhere, some special tests, so that a larger field may be covered, and the best tests selected by survival of the fittest. Our results with after-images seem to show that the test is a good one. We get definite results, combined with great individual differences. The differences depend on attention, power of observation, etc., and, perhaps, on inherent differences in the nervous system, which may prove typical when correlated with our other determinations.

Imagery was tested by letting the student fill in a blank containing the questions printed below. The answers are given in percentages (95 subjects) after the questions.

Think of your breakfast table as you sat down to it this morning; call up the appearance of the table, the dishes and food on it, the persons present, etc.

Then write answers to the following questions:

- (1) Are the outlines of the objects distinct and sharp? Yes, 86.5%; No, 6.2%; miscellaneous, 7.3%.
- (2) Are the colors bright and natural? Yes, 83.3%; No, 10.4%; miscellaneous, 6.3%.
- (3) Where does the image seem to be situated? In the head? Before the eyes? At a distance?

In the head, 28.7%; before the eyes, 36.2%; at a distance, 33%; miscellaneous, 2.1%.

(4) How does the size of the image compare with the actual size of the scene?

Same, 53.7%; smaller, 45.3%; miscellaneous, 1%.

(1) Can you call to mind better the face or the voice of a friend?

Face, 75%; voice, 14.6%; miscellaneous, 10.4%.

(2) When 'violin' is suggested, do you first think of the appearance of the instrument or the sounds made when it is played?

Appearance, 76.8%; sounds, 23.2%;

(3) (a) Can you call to mind natural scenery so that it gives you pleasure? (b) Music? (c) The taste of fruit?

	Yes.	No.	Miscellaneou
Scenery,	94.6%	4.3%	1.1%
Music,	89.1%	9.8%	1.1%
Taste of fruit,	68.1%	28.6%	3-3%

(4) Have you ever mistaken a hallucination for a perception, e. g., apparently heard a voice or seen a figure when none was present? If you answer 'yes' describe the experience on the back of this sheet.

Yes, 74.7%; No, 25.3%.

As we have already had occasion to state those tests that are of special interest to the psychologist are often ones with which it is difficult to get definite results. The student has had no practice in introspection and even a trained psychologist may find it difficult to fill in such a blank. For this reason we have added to several of the questions proposed by Mr. Galton others admitting of more definite answers. On the whole we think it desirable to make this test. A discussion of results would lead us beyond the limits of a general article.

CONCLUSIONS.

Our experience with these tests leads us to recommend that they be made a part of the work of every psychological laboratory. When used with freshmen on entering college the record is of interest to the man and may be of real value to him. It is well for him to know how his physical development, his senses, his movements and his mental processes compare with He may be able to correct defects and those of his fellows. develop aptitudes. Then when the tests are repeated later in the college course and in subsequent life the record of progress or regression may prove of substantial importance to the indi-The making of the tests brings the psychological laboratory into relation with a large number of students and with other departments of the university, shows the modern methods of anthropometry and experimental psychology, and may lead to a more serious study of these on the part of a larger number of students.

The psychological laboratory can also be brought into mutually helpful relations with the community by extending the tests to any who wish to have them made. Children in the schools might be tested with special advantage. For this purpose tests are especially useful which can be made simultaneously on a large number of observers. Physicians might find it an advantage to have records made of their patients. The tests are well suited for civil service examinations. If a small fee were charged in these cases it might suffice to support an assistant, the larger part of whose time would be spent in scientific work. In any case the making of the tests is good practice for advanced students preliminary to, or in addition to, special

research. By bringing the laboratory into relations with the community we add to its influence and at the same time secure the material needed for research.

We have only studied 100 individuals and regard this paper rather as an investigation of methods than as a summary of results. We think that an hour used in tests should be divided between physical, psycho-physical and mental measurements. We regard it as important that work in physical anthropology, which is a subject sure to be recognized before long by all our universities, should be intimately associated with the work in experimental psychology. We are not able to suggest any radical improvement in the tests selected or in the methods of making them; but in reviewing the individual tests we have called attention to difficulties and suggested improvements. The work is one now only begun, but likely to develop and requiring investigation and discussion from diverse points of view.

We do not at present wish to draw any definite conclusions from the results of the tests so far made. It is of some scientific interest to know that students entering college have heads on the average 19.3 cm. long, that 15% have defective hearing, that they have an average reaction-time of 0.174 sec., that they can remember seven numerals heard once, and so on with other records and measurements. These are mere facts, but they are quantitative facts and the basis of science. Our own future work and that of others must proceed in two directions. On the one hand we must study the interrelations of the traits which we define and measure. To what extent are the several traits of body, of the senses and of mind interdependent? How far can we predict one thing from our knowledge of another? What can we learn from the tests of elementary traits regarding the higher intellectual and emotional life? On the other hand we must use our measurements to study the development of the individual and of the race, to disentangle the complex factors of heredity and environment. There is no scientific problem more important than the study of the development of man, and no practical problem more urgent than the application of our knowledge to guide this development.

DISCUSSION AND REPORTS.

PSYCHICAL RESEARCH.

'Psychical Research' has so many enemies, fair and foul, to elude before she gets her scientific position recognized, and is moreover so easily vulnerable in her present stage of development, that I may be excused, as one of her foster-fathers, for uttering a word that may turn the edge of Prof. Cattell's amiable persiflage in the last number (p. 582) of this REVIEW. He seems not quite to have caught the argument of my presidential address. The inquiry, I said in substance, still remains baffling over a large part of its surface, for the evidence in innumerable cases can neither be made more perfect, nor, on the other hand, be positively explained away. It may be malobservation, illusion, fraud or accidental coincidence; it may be good and true report. One can only go by its probabilities and improbabilities; and the scientist, who goes by the presumption that the usual laws of nature are superabundantly proved, feels the improbability of 'occult' phenomena to be so infinitely great that he is practically certain that the evidence in their favor must be bad, even though he can't show in the particular case where the badness comes in. The issue between Prof. Cattell and myself is as to the general logic of presumption here. I urged that the force of the scientist's presumption, quâ presumption, might some day be worn out by the accumulation of 'psychic' cases, long before his doctrine of nature was radically overthrown, as it would be were a single case conclusively proved. Prof. Cattell says: "When we have an enormous number of cases, and cannot find among them a single one that is quite conclusive, the very number of cases may be interpreted as an index of the weakness of the evidence;" apparently holding the scientist's presumption to be actually strengthened by the quantity and quality, taken together, of the psychical research reports. It would indeed be strengthened if, pari passu with the accumulation of reports, there went for each concrete type of case a parallel accumulation of demonstrations of its erroneousness. And as this is just what happened in the 'physical mediumship' type, the work of the S. P. R. in that field has been

mainly destructive. But it has happened practically nowhere else. In the veridical apparitions, in the chief thought-transference experiments, fallacy has been assumed, but not clearly demonstrated. The presumption has remained presumption merely, the scientist saying, "I can't believe you're right," whilst at the same time he has been unable to show how or where we were wrong, or even except in one or two cases to point out what the error most probably may have been. In such a state of things people trust their instincts merely, while waiting for a final proof. Many naturalists, for instance, consider the evidence for the sea-serpent practically sufficient. In others it provokes a smile. Meanwhile a single sea-serpent dragged up on the beach would settle the matter forever. I spoke of my own final proof or psychical sea-serpent-corpse, under the name of a 'white crow.' Professor Cattell says: Can the exhibition of any number of gray crows prove that any crows are white? But our reports are not of gray crows; at the very worst they are of white crows without the skins brought home, of sea serpents without the corpse to show; and where there are such obvious reasons why it must be easier to see a wild beast than to capture him, who can seriously maintain that continued reports of merely seeing him tend positively to decrease the probability that he exists? In the case of telepathy, ghosts, deathapparitions, etc., the reasons why the evidence is always likely to be imperfect rather than perfect are equally obvious, and the logic is the same as in the wild beast case. Continued reports, far from strengthening the presumption that such things cannot exist, can only detract from its force.

Both here and in my address I have played into the hands of the scientist, and granted him every conceivable concession about the facts for the sake of making my point as to the logic of presumption all the more clear. But there is such a thing as being too fair-minded, so that one wades in a very bog of over-reasonableness. For, in point of fact, the concrete evidence for most of the 'psychic' phenomena under discussion is good enough to hang a man twenty times over. The scientist's objections, on the other hand, are either shallow on their face (as where apparitions at the time of death are disposed of as mere 'folk-lore,' or swept away as a mass of fiction due to illusion of memory), or else they are proved to be shallow by further investigation, as where they are ascribed to chance-coincidence. May I add a word to illustrate this?

On page 69 of Vol. II. of this REVIEW, I summarized the elabo-

rate Sidgwick's report on the Census of Hallucinations. That paper concluded that the stories of apparitions occurring on the day of the death of the person appearing were 440 times too numerous for the phenomenon to be fairly ascribed to chance. I said that the chief objection practically to this conclusion was that the census, covering only 17,000 cases, was still too small. Last spring I wrote a letter to Professor Sidgwick, giving, for quotation at the Munich Congress, the results of my American census of 7,123 cases. They prolong and corroborate his own. The 'yes' cases were 1,051 in number, or 14.75% of the whole. I cite part of my letter:

"Of these yeses 429 were without particulars, and in 36 the percipient had not signed the account. Only 586 subjects thus remained for statistical treatment.

"Of these, eliminating all who had the experience before they were 10 years old; and all who gave vaguely plural experiences, there remain 62 subjects with 71 cases of visual hallucination of some recognized living person. Of these, 12 are reported to have occurred on the day of the death of the person seen.

"These numbers are so small that I have not ventured to reduce by any elimination of 'suspicious' cases, as you did, but as a correction for oblivion have multiplied the whole lot by your figure $6\frac{1}{2}$.

$71 \times 61 = 462$ (in round number).

"Let this 402 represent the probable whole number of visual hallucinations of living persons really seen by the percipients since their tenth birthday. The 12 veridicals are in round numbers $\frac{1}{18}$ of 462. Therefore $\frac{1}{10}$ is the probability induced from facts, and due to the unknown cause of apparitions, that if a man 'appear' at all it will be on his death-day.

"On the other hand (the U. S. death rate being practically the same as that of England) the pure chance that if any one appear on a certain day it will be one who is dying on that day is only $\frac{1}{10000}$. But $\frac{1}{10} = \frac{1}{10000} \times 487$; so that apparitions on the day of death are, according to our statistics, 487 times more numerous than pure chance ought to make them.

"The details will be sent later, but I append now a few remarks. Of the 71 cases, all but the 12 that were death-apparitions are treated as insignificant in the statistical result. But this, though inevitable, is unfair to an occultist theory of their origin, since 16 of them, though not veridical of death, were coincidental in other ways. E. g., 6 were collective, 2 were reciprocal, 1 was voluntarily produced by the distant agent, 2 were premonitory and 3 were veridical, but not of death. But let this pass. There remains another unfairness to occultism in our systematic rejection of all vaguely plural cases. I rejected 19 percipients in all for this reason, but 7 of these percipients gave us coincidental cases, 2 of them being apparitions at time of death.

"We can afford to be very generous. Suppose we throw in these 19 subjects as if each stood for one non-coincidental case. Suppose we multiply for oblivion by 10 instead of $6\frac{1}{2}$, making 900 cases in all. Suppose we take only $\frac{1}{2}$ of our 12 veridicals. We shall still get $\frac{6}{900} = \frac{1}{180} = 126$ times $\frac{1}{18000}$, the chance-probability."

The objections to be urged are:

" I. Smallness of numbers. But the agreement of our figures with yours

goes against this.

"2. The collectors packed their sheets with veridicals. As a matter of fact, they say they knew the answer beforehand in 3, possibly in 4 cases. In 5 cases they state their ignorance. In 3 they say nothing. From the warning against packing with yeses and the very large number of veridicals that the collectors furnish separately, this objection is probably not very important.

"3. The veridical cases are not strong. They are not. Only 5 have any corroboration, and in no case is it first-rate. Our best cases are not among these. But this is an argument at any rate in favor of the sincerity of the Census; and since coincidentals and non-coincidentals are treated homogeneously (at least all the deliberate treatment going against the statistical result, where they are treated otherwise than similarly), the ratio of the surface figures is perhaps a fair one.

"But I never believed and do not now believe that these figures will ever conquer disbelief. They are only useful to rebut the assurance of the scientists that the death-warnings, if not lies, are chance coincidences. Better call them lies

and have done with it."

I make this quotation, first because of the facts themselves, but mainly because I have above too easily granted the ambiguity of the evidence for such phenomena, and I wish to show, by a new example, how, when two interpretations are possible, it is not always the scientist's which has the greater numerical probability in its favor, or which is the more carefully or conscientiously weighed.

WILLIAM JAMES.

PSYCHOLOGY AND LOGIC-FURTHER VIEWS.

The discussion opened in the May number of the Review, by Dr. G. M. Stratton, on the proper statement of the relation between psychology and logic, is one that may profitably be followed up; and let us hope that it will be. Dr. Stratton's paper is marked by a large lucidity that we have now learned to expect in what he writes; and, from the point of view likely to be held by the majority of his readers, it will probably appear conclusive. To some, however, and of these I confess myself one, it will be thought-provoking rather than satisfying, and its value will lie rather in the graver questions which it suggests than in its settlement of those nearer to the surface which it directly discusses. In the hope of leading to a still fuller comparison of views, I wish in the present article to bring out some of the more prominent queries that Dr. Stratton's paper has stirred in my own mind. I do this the more willingly, because the view he advocates,

while strongly opposed to that which has generally been current, is one which (I believe) has also been advocated by Professors Strümpell and Münsterberg; very likely, therefore, it may be shared by many of the experts in the new psychology; so that Dr. Stratton's independent defense of it, so clear and forcible, will probably have the effect of fixing in the convictions of the younger psychologists (and logicians, too) a doctrine of which I am persuaded we ought at any rate to say that it does not reach the bottom of the question, however truly it may supply a needed advance from the view earlier prevalent, that logic is adequately described as simply a province of psychology, and of psychology regarded as a science of observation.

It must seem plain, I think, that Dr. Stratton has made his propositions out unanswerably, if psychology is to be defined as he evidently assumes that it is, and, indeed, expressly declares it to be-as the science whose distinctive and ultimate problem is to explain mental phenomena, in the sense, solely, of determining their 'natural causes;' that is, the chain of regular and systematic antecedents that are found on critical observation and experiment to attend them in consciousness. Logical norms, imperatives over thought-values, Dr. Stratton rightly says can get no footing by an observational science; that is, none as imperatives. He admits, of course, that psychology as an observational science cannot avoid taking note of the logical forms, as facts of consciousness; these belong, in short, to descriptive psychology. His point is, that they cannot properly belong to explanatory psychology, when explanation is defined as the determination of merely 'natural' causes; and he implies that explanation, in this sense, is what constitutes the gist of psychology—is, in fact, what makes psychology psychology. To put his case in a different way: Logic, like ethics and æsthetics, is a normative or legislative science—a science of mandatory standards of value. Consequently, it cannot be made out by any inquiries into the natural causes of conscious facts; nor, on the other hand, can it contribute at all to the settlement of what such causes in any specific case specifically are. Logic, as a conscious fact to be explained, must accept its explanation, so far as any may be forthcoming, from explanatory psychology; and, per contra, psychology must accept from logic all the canons of thought-integrity, precisely as it must accept from ethics the canons of moral integrity, and from æsthetics the canons of taste.

On this view, one thing is noticeable that Dr. Stratton perhaps overlooks, or at any rate has understated. He admits that logicians are in the habit of trenching on the ground which he has reserved to

psychology, and thinks this is not seriously reprehensible, provided the offenders, and others concerned, clearly understand where and when the trespass is committed. The logic people, he implies, are in such cases dabbling in descriptive psychology, and it would help things if they clearly knew and acknowledged the fact. But he omits to say, and thus prevents us from knowing whether he notices, that it is beyond their power to do otherwise. Yet is it not plainly the truth? For how in the world is the logician to make any statement of his science, without, for instance, drawing the distinction between conceptions, judgments and syllogisms, and describing accurately in generalized definitions what these forms of conscious fact are? This inevitable trespass of the logician upon the psychological preserves, even if it be only in their outer border of description, and, because of this inevitableness in the trespass, the reciprocal participancy of psychology in an essential act of the science of logic, stirs thoughts in one which I confess I do not know how to get rid of consistently with stopping at Dr. Stratton's doctrine; and I find myself wondering whether he, and those who share his view to the full, have reckoned with it to the bottom. If psychology and logic are really so clear of each other as the new doctrine implies, then why can they not be expounded in entire separation? Why must the logician take a hand in psychology, willy-nilly, and perforce sin against his own canons of division? I have my suspicions that the trouble comes from the very definition of psychology with which this view sets out, and that the very conclusiveness with which the view follows from that definition should be a warning to us that something is wrong in the definition itself.

In this brief discussion I shall not even attempt to reach any final solution of the question here involved; much less to vindicate it. I shall be satisfied if I can make it clearly apparent that a defect of clarifying view exists, and give some hint of the direction in which we are to look for a view that is more comprehensive. I must say, too, that in these suggestions I am aiming at a school of views rather than at Dr. Stratton's own, and with an eirenical rather than a polemical motive. For I suspect that the discussion of the apparently superficial question raised by Dr. Stratton, if pushed to its depths, will expose a clue to the dispute between the so-called old psychology and the new, and indicate the way to its reasonable solution.

The view of the relation between psychology and logic presented by Dr. Stratton admits that the province of conscious fact covered by logic is also covered by descriptive psychology, but excludes it from

explanatory. But what justification can there be for this abrupt arrest of the chief function in the new psychology? If psychology in its function of description must take cognizance of our apprehension of the logical norms, as a psychic fact, why must it suffer sudden arrest of its function of explanation in presence of that fact? Is it not, on the contrary, bound to explain the norms, if they are facts that it can describe? Or, is the difficulty this, that the very description which it gives of them shows them to be of such a nature as passes its powers of explanation? The latter is the manifest fact; as Dr. Stratton notices, when he says, correctly, that the contents of logic supply us with a canon of criticism, and that this canon must be accepted ab extra by observational psychology. But, I insist, why should a science of mind accept anything, merely ab extra and as sheer, dead, unintelligible fact? Dr. Stratton would very likely answer, that an all-embracing and entirely thoroughgoing science of mind would not do so, but that psychology, as he understands that term, and as the new school understands it, lays no claim to being a science of mind all-embracing and entirely thoroughgoing. Rather, his contention is that there is no one science of mind that is thus comprehensive and profound, but that our knowledge of mind, such as the knowledge is and can be, is only possible through several collaborating sciences; and that the exact discrimination of these, and in general a careful observance of their boundaries, is an important aid in the best performance of their separate and their collective tasks.

I would not be thought to deny the truth of the last proposition, nor its relative importance. But I incline to insist that its importance is only relative, and that its truth is not absolute. Moreover, what is of greater import is this: The partial and relative truth brought out in the undeniable proposition that a merely observational psychology, with its explanation (so-called) by means of unvarying antecedents accurately determined, is incapable of explaining anything canonic in consciousness, forces us to ask: What, then, is the source and the authority of such canonical forms? To say that nobody can possibly tell; that they must be accepted 'from without,' absolutely; that there is no conceivable psychology which can ever throw any rational illumination on their legislative authority—this is the same as saying that they have no rational worth at all; that their operation in our consciousness is just the dead pressure of an impenetrable necessity, and that therefore they are no guide to truth, but simply express the brute fact that we are as we are, and are forever incapable of knowing what our judgments are worth, or whether they are worth anything; that, at best,

we can only register the processes of our being, and describe the connections of its mechanism.

But if this is so, let us not forget to draw the fact out to its full conclusions. For if there is within our powers no capacity to warrant the objective worth of our canons of judgment, then we are not capable of any psychology at all, even in the humble sense of description and 'natural' explanation; we are not capable of any science, however modest in its aims; nay, we are not capable even of that last apparently fatal judgment, that we can only register our own mechanical, meaningless processes. For the judgments of psychology not only have to accept, as Dr. Stratton says, the canons of logic 'from without,' but they have to submit to them; they depend on them, and all their results are vitiated by them if once we admit that they have no ascertainable worth. If they, too, are only mechanical facts, untransparent to intelligence, then their operation in us can lead to no real explanation, even of a partial and relative sort; our psychology ceases to be a science, in anything but the name, and even our professed registration of dead facts dissolves into illusion; everything becomes the seeming of a seeming, the dream of a dream.

But when we seriously ask for the source of logical canons, for the source and credentials of their authority, what possible answer can we really get but this: That they rest on the simple witness of the mind, on the testimony of self-consciousness? And what name can we give to the account of this last possible court of appeal, unless we call it, in some proper and inevitable sense of the word, psychology? It is not a merely observational, much less an experimental psychology, doubt-But it seems none the less to be a fact that can neither be escaped nor evaded. It is, rather, the Rational Psychology, necessary and unconditional, free from all contingency, which, in no way hostile to the psychology of observation and experiment, but demanding this as its indispensable aid and supplement, furnishes the indispensable presuppositions and conditions without which no experimental science, and not even experience itself, would be possible. It is true enough that logic is no part of simply observational psychology, any more than ethics-I mean, of course, an ethics of Duty-or any more than æsthetics is. But as an observational psychology is only a partial psychology, which depends for its methods and for the validity of their results on the validity of logical laws as laws, and, like these must finally go back for its warrant to the rational psychology of an absolutely real self-consciousness, completely autonomous, it would appear that the true answer to the question of the relation between logic

and psychology is found by denying, indeed, the inclusion of logic in empirical or observational psychology, but by including it, along with all the sciences, normative or explanatory, in the comprehensive whole of rational psychology. This whole is organic and genetic (rather than simply generic) relatively to these sciences, and, among them, to the new or experimental psychology. Rational psychology, as the account of the conditions in pure self-consciousness for experience in every form, is the heart and real meaning of the old psychology; and the new psychology, while rightly correcting the error of the old in attempting to extend the authority of direct self-consciousness over the details of experience, and justly disputing this intrusion into fields where pure thought unsupported by perception would be fruitless, must acknowledge its reciprocal dependence upon this heart of the new as well as of the old-this soul, in fine, of all science whatever. Without the recognition of this organic psychology, the secret of truth in the judgments of all psychology, there would be no solution of the question how logic is related to psychology or to any other science; nor, above all, how logic can be an Organon of science—a law of physica things as well as a self-legislated law of mind.

I know how easy it will be to feign a discredit of all the foregoing by affecting that it is all a mere dispute about the use of a word. But in the somewhat current employment of the word Psychology in the meaning of the new psychology only, there is an ignoring of a real fact—the fact of self-consciousness and its pure constituents that are the bases of all science, as they are likewise of all possible experience—a fact which must be recognized, by whatever name it may be called. In that great fact lies the real being and vigor of the soul; and it would be a strange and irrational victory that should strip from the authenticating account of that fact its time-honored and legitimate title of Psychology—the Science of the Soul in the highest and most significant sense of the words.

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THE PSYCHO-SENSORY CLIMACTERIC.

In following the results of recent studies in the visualizing powers of various classes and individuals one is struck by the predominance of this power, according to the reports, at least, among naïve classes and conditions. By visualization is here meant the power of actually reproducing the object of memory with its color and outlines, as con-

trasted to the remembering of something about the object. It is doubtless true that the latter is frequently mistaken for the former and is so reported, and the writer has been inclined to believe that the difference above referred to, as appearing in the cases collected by Galton and Preyer, and particularly by American observers, is largely due to the greater discriminating power of those who confess themselves to be non-visualizers. The difficulty of properly interpreting and describing these experiences is quite like that which perplexes the blind who have had no experience of vision.

Non-visualizers may frequently have a strong visual memory in the sense of recalling accurately the judgments based on the perception. One curious and important form of such memory is that which may be called dynamic and consists in the translation of the data of visual sensation into terms of latent muscular contraction. Thus one may find himself able to reconstruct the outline or image when, with pencil in hand, he attempts to draw it. Doubtless such minds, when attention is directed to an object, instinctively go over it dynamically. writer when desiring to fix the outlines of an object is often obscurely conscious of a mental tracing of the outlines in which the movements of the eye are associated with vestigial reproductions of the effort sensations which would have been called out in the manual tracing. It seems to the writer that there is a vast substrate of dynamic vestiges beneath what is called memory. 'Trying to impress a thing on one's mind' is simply the revival of dynamic vestiges. It would be impossible to a mind which should really be a tabula rasa and reproductive power would increase with the increase of experiences. monest forms of these dynamic vestiges are connected with speech, but we should not fail to recognize that memory is not dependent on language.

It is a familiar fact that many experiences have a fringe of spatial association. Thus it is common to find that one has located the events or objects in a narrative (quite unconsciously to himself at the time) in some part of his spatial sphere—to the right or left, above or below—or perhaps with reference to some prominent preëxisting element in spatial consciousness. In attempting to recall the object one finds that the 'clue' belonging to the unrecalled but not forgotten object is a locality. "It does seem as though, if I could fix my attention on the upper left corner of the visual field intensely enough, it would reappear!" Here again is a dynamic vestige. It is not necessary to illustrate further, but it will be admitted that these and many other elements in reproduction substitute in mature experience for a visualized reappearance of the impression.

It may be safely assumed that the materials of the visual image are infra-cortical, while the really vestigial elements are generated within the cortex. If this is correct there is a very useful distinction to be made between the two classes of elements in the reproduction. It will be remembered that one class is not in consciousness. When one recalls the image with its colors and form *objectively* to mind, as good visualizers claim to do, this objectivity is due to the same cause which gives to the actual object its outwardness. The materials come to the cortex and are there construed exactly as in the case of primary vision. This may amount to actual hallucination or may be so slight as to but faintly tinge the reproduction. On the other hand, when a poor visualizer, like the writer, recalls any object it is by a marshalling of cortical vestiges and judgments and thus the result has none of the objectivity just described.

The writer has elsewhere insisted on the necessity of discriminating sense content from sensation and precisely this distinction is here required. The good visualizer reproduces the sense content along with the cortical vestige, while the non-visualizer only requires to revive the cortical or conscious equivalents of this content to have what serves for him the purposes of a complete reproduction. This difference is like that seen between the sophisticated and the naïve individual in the act of portrayal to others. The latter finds it necessary to reproduce by gestures and mimicry as many as possible of the events described, while the former is content to rely solely upon his repertory of verbal sounds. In exactly the same way the naïve mind requires to reproduce the actual pictures which called out the conscious states of a previous experience in order to live over the latter, while the trained consciousness disdains such mediation. The more one is accustomed to live in the world of abstractions the more complete does this independence of the sub-conscious mechanism become.

Upon the theory of consciousness elsewhere advanced some interesting suggestions may be hazarded. If consciousness depends upon fluctuations in the equilibrium of concentric forces in the brain, and if the anatomical mechanism for the supposed complicated balance of interdependent forces is primarily within the cortex, it does not follow that reactions of other centres do not affect the equilibrium. On the contrary, it is of course chiefly the stimuli from lower centres which constitute the material for consciousness. Ordinarily the impact is from without, but its *form* is determined by the cortical intermediary mechanism. Yet the distinction between the force and its form probably does not lie wholly in the cortex. Even in mature life these limits are

undoubtedly more or less shadowy. In naïve and primitive states it may be supposed that the equilibrium of consciousness is still less limited and the *form* of conscious reaction may be more largely influenced by direct participation of lower centres in the equilibration which determines the nature or 'content' of consciousness. The progressive limitation of the sphere of consciousness may be part of the evolutionary process by which a diffuse somatic consciousness has been concentrated and freed of corporeal limitations, or, to speak broadly, 'spiritualized.'

However all this may be, a series of very interesting practical problems in pedagogy associate themselves with the change in method of reproduction which we may call the *psycho-sensory climacteric*. It will be admitted that the undoubted gain in efficiency and promptness afforded by the habit of abstract reproduction is accompanied by a distinct sacrifice in objective independence and clearness, just as the narrative of the savage is likely to be more forcible and vivid than that of the 'Cultur-mensch.' It becomes a serious question therefore whether the premature attempt to hurry children into abstract topics, such as may require recollection of symbols for the effects experiences rather than the simple data of experience, and especially such as call for introspective study, may not deprive the child of a precious store of concrete data which ought to form the substantial foundation for later thinking.

There are also several professions where the power of objective memory is of the highest possible service. The artist and word painter particularly must see the object before his mind's eye and it cannot be doubted that the creations of fancy partake of the same character as the actual reproductions of sense.

It may be urged that more attention should be given to symmetrical mind training in secondary schools. It is a grave mistake to suppose that memorizing of a text is an all-round training in memory. The formation of dynamic vestigial associations other than speech are necessary. Thus, training in drawing and music are of the highest importance quite independently of any interest or value attaching to the arts themselves. They serve to reënforce the memory with powerful dynamic associational elements which arm the thought with vigor and persistence. The practice in composition and description, especially the description of objects and events actually in experience, is of the highest importance. Abstract mathematics should come later than natural history. Physics especially can hardly come too early, while chemistry is far less adapted to an early stage. Descrip-

tive botany and zoölogy are among the most important means for serving the end sought, provided the instructor have a vital acquaint-ance with the subjects to enable him to discriminate in presenting the data and to clothe them with flesh and blood. The average 'general lesson' in natural science has been a frank failure and has done vast harm. It was my privilege (?) to hear a bevy of school teachers cramming for their general work and hustling 'waders,' 'swimmers,' 'scratchers,' etc., into captivity in a most heterogeneous fashion with many a groan and sigh, and it was little surprise to discover that their pupils a few days later were echoing the sighs and groans, while the 'waders,' 'swimmers' and 'scratchers' reappeared in motley never known to nature.

There is one class of associations which is of still greater importance for the fulness and happiness of life; it is the subtile connection between visual and auditory reactions and the circulatory centers and their reflexes. What the association with the motor reflexes does for the life of action and thought, that with the vaso-reflexes does for feeling and emotion. A certain nuance or intensity or contrast of colors produces in a sensitive nature a distinct circulatory change. To a much greater extent is this true of sounds. It is certain that this change is not a secondary result of an emotion, but a direct physiological result, though a very important part of the substructure of feeling. To one who frequently yields himself to the touch of these fairy fingers and permits the fibres of his being to pulsate to the preëxisting harmonies of his own being there comes a ripeness and richness of experience casting a glamour over prosaic drudgery and keeping fresh the springs of thought. Nor is this in any purely sentimental sense, for when a familiar psychosis is clothed with a pleasing or effective feeling tone it has the cogency of a novel sensation; it has the freshness which makes it a power in reproduction and dominant in association. Plato's ideas of the influence of æsthetics in education are found to be sustained by the best results of modern neurology. No man can afford, even from the standpoint of intellectual efficiency, to permit the premature advent of the psychical climacteric. C. L. HERRICK.

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PSYCHOLOGICAL LITERATURE.

An Outline of Psychology. EDWARD BRADFORD TITCHENER. New York, The Macmillan Co., 1896. Pp. xiv+352.

The prominence given to quantitative determinations, the division of sensations into peripheral and central, and the definition of consciousness as process, are some of the features that mark the present work clearly as coming from a disciple of Wundt. Putting the question of standpoint aside, Professor Titchener's book is a most valuable addition to the literature of experimental psychology. Indeed, it is not too much to say that it is the best digest of that subject that has yet appeared in English. The style is clear and the arrangement of the subject logical. The author starts with a three-fold problem: to analyze mental experience into its simplest components; to discover how these elements combine, and to bring them into connection with their physiological conditions. The third problem is brought up here and there throughout the work, while the other two form the basis of the main discussion. The elementary processes of sensation, affection and conation are first treated, in order; then the complex processes of ideation, feeling and voluntary movement; finally the higher syntheses -memory, self-consciousness, reasoning, etc., on the intellectual side, the sentiments on the affective, and the reaction problem on the active. This progressive scheme is admirably worked out, though unfortunately the casual reader is not likely to trace it through the latter part.

As might be expected, considerable space (three chapters) is devoted to sensation, and the treatment of this element is most thorough. The author emphasizes quality as the distinctive mark of the sensation, rather than its intensity, extent or duration. He spends some time in discussing the number of distinct qualities and the experimental methods of testing them. It is a great desideratum in a general survey of the field to distinguish clearly the various minor sensations—joint, tendon, static, sexual, alimentary, pain, etc.—and in this Professor Titchener has succeeded very well, considering the limitations of our present knowledge and the confusion that has prevailed regarding some of them. He classes physical pain, about which there has been so much discussion of late, as a common sensation, due to the exces-

sive stimulation of any sense-organ or the injury of a sensory nerve. Weber's Law is discussed at some length; he gives it a purely physiological interpretation, and believes that the deviations observed near the limits of sensibility are due to variations in the excitability of nervous substance with different degrees of stimulation (p. 89). The treatment of affection is interesting because of the prominence which the author gives to it as an element of consciousness distinct from sensation. He ascribes it to the general anabolic and catabolic bodily processes, rather than to the action of special stimuli, and devotes several pages to showing the difference between pleasantness and unpleasantness (as he terms pleasure and pain), and pleasant and unpleasant sensations. Professor Titchener comes out squarely against the theory of a third conscious element corresponding to activity. The two elementary 'active experiences' are conation and attention: conation is 'the experience of effort or endeavor,' but its conscious elements are all either sensation or affection; and attention reduces to the same terms. Yet although they have no direct conscious equivalent, the physiological processes which make up what the author terms bodily tendency are important factors (he thinks) in determining the direction of psychic life.

Part II. deals with the complex processes which arise from the union of elements, and constitute the real elements of adult life. The perception and idea are treated as practically identical, although only peripheral sensations are concerned in the formation of the former, while 'central sensations' always enter into the latter. A chapter is devoted to the association of ideas—a term, by the way, which the author regards as inaccurate and misleading, and only adopts on historical grounds. It is difficult to see the force of some of Professor Titchener's distinctions between association classes. For example, after distinguishing simultaneous and successive association, he divides the former again into associative supplementing and word-association. Psychologically speaking, these two are quite similar, and neither of them is very different from the primary idea, since the name, e.g., often forms as essential a part of our idea of an object as its odor, or some other sense element. Here, as in one or two other places, the author seems to leave the psychological standpoint for the metaphysical. Under successive association he recognizes two forms: The train of ideas and association after disjunction. The latter includes judgment, which is disposed of in a single paragraph (p. 207). The term association after disjunction itself is open to criticism. It is defined as 'the coming together again of ideas which were originally together,

but have somehow become separated' (p. 205). But the judgment: 'This house is a hotel' (to use the illustration given, p. 207), may consist in adding to a certain house-idea elements which have never been associated with this particular complex before; and if the author simply means that some elements in the complex have been previously associated with the (hotel) idea, this is equally true of all kinds of association,—according to his own formula: ab-bc,—and cannot be the mark of any particular class.

Passing to the affective side, Professor Titchener makes a neat distinction between affection as an element and feeling as the complex which we experience—a distinction corresponding to that between sensation and idea. Emotion is a still higher complex and 'stands upon the same level of mental development as the simultaneous association of ideas.' His classification of the emotions as present and future on the one hand, and subjective and objective on the other, will probably meet with criticism from several quarters, the most obvious objection being the omission of the past. A chapter on voluntary movement follows, and shows the change which has come over the treatment of this phenomenon in the past five years. The innervation-sense theory is cast aside. Action is arranged in an ascending series of classes, from impulse to reflex and instinct, thence to the more complex forms of selective, volitional, and finally automatic action.

Part III. treats of still more complex processes. It is not altogether clear why memory should be placed here, with self-consciousness and reasoning, rather than with ideas. On the affective side, the analysis and classification of the intellectual and æsthetic sentiments is especially able. The chapter on synthesis of action furnishes a good summary of the reaction-time experiments; unfortunately Professor Titchener follows the Leipzig view implicitly, and ignores the type theory of reaction which has been established independently by Baldwin, Flournoy and Angell.

The concluding chapter is on the nature of mind. The author is content to assume the principle of psycho-physical parallelism and leaves the ultimate question to metaphysics. In the final section he quotes Lotze, who speaks, of course, from the metaphysical standpoint. This quotation might better, perhaps, have been omitted, as it is rather beyond the ordinary reader, and may lead him to believe that the author is endeavoring to dodge the issue, while the rest of the chapter is an earnest attempt to show that the question really does not belong to psychology to settle.

In estimating the value of Professor Titchener's work, it must be

borne in mind that it is expressly designed to be a résumé of experimental psychology (see Preface and p. 19). Unless this is clearly understood, we may be apt to protest against the summary way in which certain mental processes are dismissed. Judgment, e. g., is a highly developed and specialized process, and as such deserves, like speech, some extended notice in a work on general psychology; in experimental work it is scarcely distinguishable from several other forms of association, and may properly be treated under the same heading as they. It would have been better if Professor Titchener had qualified his title by inserting the word experimental, and avoided the chance of misconception.

An outline work cannot, of course, be expected to take up every disputed point; but in order to be reasonably thorough it should certainly mention the more important differences of opinion. Professor Titchener's book fails in this respect. The author says nothing about alternative theories of physical pain (p. 65), or emotional expression (p. 227); in discussing conation he does not mention the 'innervationfeelings,' so that when the term comes up later, in another connection (p. 237), it is quite without explanation. The names of those associated with prominent theories are withheld in many cases. Thus the three-color theory of color perception is adopted (p. 49) without any reference to the names of Young or Helmholtz, and there is no mention of Hering's theory or the retinal vibration theory of Charpentier. The reader of a scientific text-book has a right to know the prevailing views on important points, whether they agree with the author's or not; if there is no room for discussion, the principal literature on the subject should be cited, at least. Moreover, it is not too much to ask that the sources be cited for the experimental results that are given. The description of experiments is necessarily very condensed in the present work, and references to the originals might prevent misunderstanding in many cases; or readers might easily wish to pursue the matter further, -e. g., to inquire about the various complications of conditions in reaction-time experiments, to which Professor Titchener refers (p. 327). Careful search fails to reveal a single reference to modern psychological literature in the entire book. This is certainly a most singular omission and is much to be regretted. The book is, in a word, too self-complete. It lacks thoroughness, and while it is extremely suggestive, it takes no pains to direct into proper channels the desire for further reading which it will undoubtedly provoke. The failure in this respect is apparently not due to any real dogmatism on the author's part, for the general treatment is broad, and there is

no attempt to slur an issue. It seems to spring, rather, from too great a desire for condensation, or an under-estimation of the reader's capacity.

In the way of minor criticism may be mentioned a slight tendency to alter accepted terminology, which is scarcely in place in a book of this character: cognition is made a special kind of recognition (p. 266); the terms pleasantness and unpleasantness are used instead of pleasure and pain, etc. However, this is not so marked as in the translation of Külpe's work. The author occasionally ventures upon the 'etymological argument;' e. g., in speaking of the principal colors (p. 49), and in discussing the origin of association, etc. (p. 301). This kind of argument is best left to the old-school psychologists.

In spite of its omissions (and minor commissions), Professor Titchener's work is an able presentation of psychology viewed from the experimental standpoint. The analysis is sharp and thorough, and in this respect the book will be of value to every 'school.' As a text-book it has a wide field before it, and we may hope, besides, that it will find its way into the hands of the 'laity,' and help to dispel some of the grotesque notions that are prevalent about experimental psychology.

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Lehrbuch der allgemeinen Psychologie. Dr. Johannes Rehmke. Hamburg and Leipzig. 1894.

* The work before us represents a field of labor of which every psychologist must recognize the importance. In proportion as a science develops, it becomes more and more reflective, and the need of questioning and of restating its fundamental assumptions becomes more and more keenly felt. The appreciation of this need has evidently prompted our author to his present task, and the thoughtful, painstaking tone of his effort gives it a claim to respectful attention.

In a preface devoted to a discussion of the nature (1) of science in general and (2) of special science (Fachwissenschaft) he sets forth the aim of the former to be the attainment of unquestionable clearness (p. 1). This ideal of science is only to be reached through a continual questioning of given experience. But the answers to the questions that arise within the science militant are only to be obtained by an appeal to the object (p. 4). We find here the old assumption that the subjective (pp 1, 2) clearness and objective truth must ultimately correspond. The discussions of the past, of Descartes, Leibnitz and Spinoza have not demonstrated the necessity of such an assumption, and Rehmke does not appear to be conscious of a problem.

Science then asks questions and appeals to an object for answers. This object Rehmke defines in his somewhat peculiar terminology as a 'concrete,' i. e., an element of experience which is a unit including changing phases. A special science has for its problem the laws of change of its 'concrete' object (p. 5). The object of psychology is the mind (Seele) (p. 10). In the work following the three parts are devoted respectively to (1) the essence of mind, (2) the momentary state (Seelenaugenblick), (3) the mental life (Seelenleben). The first part appears as a philosophical preparation; the second and third parts together fulfill the foregoing definition of a special science.

The philosophical standpoint worked out in the first part, stripped of much that is individual in Rehmke's way of expressing it, may be simply stated as follows: The world of experience presents two concrete forms of being—the material thing, and the self or mind (p. 40 seq.). These two concrete individuals, although completely different from each other, do not belong to two worlds that are separable from each other. Separateness (Geschiedenheit-by which Rehmke means numerical distinctness) (p. 72) of concrete individuals implies that the difference (Verschiedenheit) between them is not complete. Thus physical objects are separate because they have a common space quality of which they can represent different particularizations. But between physical thing and mind there can be no generic connection; they are 'schlechthin verschieden.' Hence they cannot be separable. On the contrary, in any momentary consciousness they are absolutely identical. "The possibility of a concrete consciousness existing at all depends precisely upon the condition that one and the same element of experience can be at the same time physical and mental" (p. 70).

The discovery of the paradox that the physical and the mental are at once totally different and perfectly identical, so far from discouraging Rehmke, furnishes him with a ground for congratulation. Thus we find, as the expression of his final position, the following: "The difference between concrete mind and physical thing * * * is so complete that the physical can be at the same time the mental; the otherness of thing and mind is so fundamental that, just for that reason, that which belongs to the concrete thing can belong at the same time to consciousness" (p. 73). The swing of the passage cited would seem to indicate that Rehmke enjoyed this paradox, and as accompanying the statement of a final position his complaisance suggests a little the picture of Nero fiddling while Rome burns. And yet the present reviewer does not wish in the least to deny the fundamental truth contained in the foregoing paradox considered as a stage in

the development of an ultimately consistent position. The dialectic through which Rehmke arrives at this position, and convicts others of errors in failing to recognize one or the other element of the paradox, is quite skilful and on the whole appears sound. Still, as a final position, few, I suppose would remain satisfied with Rehmke's statement, and, indeed, I venture to think that it rests upon a misapprehension easily discoverable, to wit: a failure to distinguish between what is immediately given in a moment of consciousness, and the context to which a larger 'reflective' experience finds it to belong. That dangerous abstraction, the immediacy of the moment, will contain, if the abstraction be complete, no distinction between physical thing and mind. Reflection may, to use another dangerous phrase, consider this immediate in different relations, one of which makes it a part of the history of a concrete thing, the other a part of the history of a concrete mind. In proportion as we perfect the abstraction (really highly reflective) of the momentarily immediate we do not obtain two totally different things that are identical (a meaningless paradox), but we lack the material out of which to construe two things at all.

We must pass over two exceedingly interesting discussions on the origin of the mind and on the interaction of mind and body, to consider for a moment the classification of mental states to which Rehmke's general position leads him. He regards mental life as a whole as made up of a series of momentary mental states (Seelenaugenblicken) following a temporal order; but not necessarily continu-The momentary state is made up of subject-content (Subjectmoment) and mental attribute (Bewusstseinsbestimmtheit). There are three such attributes: the object-consciousness, state-consciousness and causal-consciousness (Gegenständliches-, Zuständliches-, Ursächliches-Bewusstsein). These elements are immediately given in consciousness, although an extended experience is necessary before the attributes can be distinguished in thought (gedacht, p. 489). above classification is selected in place of the old division of mental states into 'thinking, feeling and willing,' on the ground that these latter terms do not imply immediately given mental characteristics, but process in time and are definable by relations to the external world (pp. 145, 349). On this ground also Rehmke rejects the dual division of Brentano and Münsterberg. The 'relation of consciousness to an object' is not the basis of classification that pure psychology can adopt; it belongs to physiology, to logic, or to ethics (p. 349).

It is to be presumed then that subject, object, state and causal con-

sciousness are not definable, and on the whole Rehmke does not attempt to define them. Yet, the object-consciousness is defined as consciousness of an 'other' (p. 144). 'Other' namely than the mental state of the moment, a relation surely that cannot be immediately given in the momentary-consciousness. Still more striking is Rehmke's further subdivision of object-consciousness, presumably from the same standpoint of 'pure-psychology,' into perception (Wahrnehmung) and representation (Vorstellung). One is surprised to find that the distinction rests on the ground that the representation is conditioned only by a cerebral state, the perception by a peripheral nerve excitation (p. 158). But suppose Rehmke were perfectly consistent, it is still true that either this subject-consciousness and these mental attributes are definable or are they not. If they are to be defined it might well 'gravel a philosopher' to discover how this might be done without involving relations that go beyond the moment and include the 'external world,' as the psychologist ordinarily uses the term. If they are not definable why call them by different names? for they have become wholly inarticulate. It is impossible to harmonize Rehmke's later and more able treatment of 'Denken' (§44) with what he here takes to be the 'pure psychology' standpoint.

In his general style Rehmke shows himself to be possessed of that kind of courage (in which the Germans are frequently not lacking) which does not fear to be dry. Add to this that he is technical and diffuse, and his book will be seen to offer little charm to the lover of beautiful style. But these very faults speak in his favor among those who prefer consistency and clearness to beauty of form. The use of technical terms lends the author far-reaching categories of criticism and of construction. The diffuseness reveals a conscientious struggle to be clear. The utility of these two faults goes far to excuse their homeliness. And then—if one is to traverse a desert, why not ride a camel?

Edgar A. Singer, Jr.

University of Pennsylvania.

Psychology and Psychic Culture. By Reuben Post Halleck. Instruction in Psychology, Louisville Male High School. New York, American Book Co., 1896. Pp. 366.

In psychology, as in the early development of other sciences, books were at first written for other scientists rather than for students, but now the time has come when we may expect psychology, which is at present studied in so many different grades of educational institutions, to be presented in the form known in other sciences as 'science-made-

easy' text-books, a term descriptive of unwise attempts to make subjects artificially easy. The author of this book has certainly thought of students in preparing his work and has avoided technicalities interesting only to specialists, and he has not given what to the student are only meaningless classifications and empty generalities, as have so many writers of psychological texts, but the book is so full, not only of illustrations drawn from every day life and from literature, but of analogies and comparisons, that it is certainly open to the charge of belonging to the type of text-book named above. The author has read considerably in recent psychology and usually states the results of research with approximate correctness, but he knows nothing of true scientific method, and his treatment of Weber's law displays shallowness and misconceptions that would be a disgrace to our ordinary high school student, hence none of his statements can be relied upon by readers as correct unless verified by reference to standard works.

The chief defect of the work is the prominence given to the interesting, in the treatment of every topic, both in the space devoted to the different parts of the topic and in the character of the illustrations used. For example: the chapter upon consciousness and attention is a very interesting introduction to the subject, but the important part of the discussion given under the head of 'Laws of Attention' occupies only about a half page, which is only half the space given in another chapter to the comparison of reflex-action to a barrel hoop, and in the chapter treating of presentation. Although many of the important truths of modern psychological research are incorporated into the discussion, yet there is nothing to help the student to distinguish between the absurd exaggerations of a French rhetorician to the effect that it is possible for epicures to distinguish by taste 'which leg a partridge has been accustomed to sleep on,' or to tell 'under what latitude a wine was produced as accurately as an astronomer can predict an eclipse,' and the generalizations made by a scientist after thousands of careful experiments. It is altogether probable that students in this and other cases will note and remember the striking statements and illustrations rather than the important facts stated and truths illustrated, unless the teacher using the book takes special pains to emphasize what the author has drawn attention from by his sensational treatment of less important parts.

The remarks thus far made apply more particularly to the psychological portion of the work. In the discussions of 'psychic culture' that follow each general topic the author gives some good practical suggestions, but the treatment is in general shallow, showing a lack of

knowledge of fundamental principles of the science or philosophy of education. This is indicated by his somewhat rambling treatment and by the apparent basing of his directions upon such absurdities as that practice in perceiving one set of qualities or objects will educate one in the perception of all kinds of objects and qualities, and that whatever association will enable a person to remember particular facts will be good for his memory, without reference to the injurious or helpful effects upon the thinking powers resulting from the habits of association that are thus formed.

There can be no doubt but that the author has consistently carried out the views expressed in the preface. "Especial effort has been made to enliven the hard dry facts of the science by employing illustrations and anecdotes to elucidate them. No one knows better than the psychologist that it is of little use to present the best of subjects in an unattractive way, because facts devoid of interesting features will not secure attention." If the author were more of a student of education he would also know that the only interest worth cultivating is a direct interest in the subject itself. It is very doubtful whether the method of treatment adopted in this work will in a very large proportion of instances lead to such a result, and it is certain that no student of this book will get any practice in earnest careful study, unless he gets it from study outside of the text. Hence, although the book has many merits, especially for general readers, it cannot be recommended as a text by those who believe in making students of their pupils.

E. A. KIRKPATRICK.

WINONA, MINN.

New Essays Concerning Human Understanding. LEIBNITZ. Translated by Alfred G. LANGLEY. The Macmillan Co. Pp. xix+861.

The translator could hardly have chosen a better work to put into the service of English students in the history of philosophy. Interest still centers in the questions about human knowledge, scarcely less so than in the age of Locke and Kant; and our age has not outgrown the need of a rediscussion of those problems that engaged the great minds of that period. To have, then, in his own language, the New Essays of Leibnitz is for the English student an almost inestimable service. For one can hardly appreciate the significance of Locke's philosophy, its strength or its weakness, who does not read the Essay Concerning Human Understanding in conjunction with these critical essays of Locke's great contemporary.

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Familiar as I had thought myself to be with Locke's Essay, my reading of Leibnitz not only led me to a profounder apprehension of the problems raised by Locke, but it opened also to my mind new aspects of those questions with which these men were engaged. The Essay of Locke becomes a new book when read along with the New Essays of Leibnitz.

Of the character of this book as a mere translation I am not qualified to give a critical judgment; the translation has every appearance of being carefully and conscientiously done; the English is certainly good, as good as it could be according to the design of the translator, which was 'to represent as faithfully and as accurately as possible, and in as good English as its form and expression admitted, Leibnitz's exact thought.'

Professor Langley has, however, done more than to give us a very good translation of an important part of the philosophy of Leibnitz; he has done a piece of fine, scholarly and most valuable editorial work; he has enriched his volume with notes and annotations which, by their comprehensive character and their judicious selection, should be of the greatest help to the student; he has seemingly spared no effort in putting this work of Leibnitz into its historical setting; passing over no name or circumstance without some note adapted to make his author's thought more intelligible. To be commended also is the translator's incorporation of the selections which form the appendix of this volume. These pieces serve admirably to acquaint the student with the position which Leibnitz occupies in the historic development of philosophy; they constitute a good orientation in the philosophy of Leibnitz.

As to contents and scope, the book contains the following: Gerhardt's excellent introduction to his Edition of Leibnitz's New Essays; this is followed by Leibnitz's earliest published thoughts upon Locke's Essay in 1696; then follow two fragments published by Gerhardt for the first time; a sketch of Locke's Essay, published in the Monatliche Anzug in 1700, with a supplement which appeared a year later. Then follow the New Essays entire, which occupy the body of the volume. The appendix of about ninety pages contains chiefly essays which exhibit Leibnitz relation to the Philosophy of Aristotle and to the Cartesian Philosophy.

The long list of additions and corrections, fifty pages in all, is inserted in this place, owing to the circumstance that most of the important matter contained in them was not available until that part of the translation of which this matter relates was already in type.

An exhaustive and well constructed index of nearly one hundred pages completes this rather massive book, but in which there is really no superfluous matter, when the translator's design and the excellence of his work are taken into consideration.

John E. Russell.

WILLIAMS COLLEGE.

La psychologie des sentiments. Th. Ribot. Pp. 444. Paris, Alcan. 1896.

This book is without doubt the most important of Ribot's works. He has summarized in it his lectures at the Collège de France, and it is surprising to find what a large amount of material he has been able to place in this volume extending to not more than 450 pages. The work is divided into two parts of equal importance, but of very different character. The first part is devoted to the simple elements of emotional life, physical pleasures and pain, moral pleasure and pain, the inner conditions of emotion, memory for emotions, and the relation of the association of ideas to emotion. Throughout this part the author most frequently makes use of physiological observations and experiments, drawing especially from the psychological laboratory. In the second part he reviews the special emotions-fear, anger, affection, love, the social, moral, religious, æsthetic and other feelings, and here he has made use of anthropology, the history of customs, of the arts, of religions and of the sciences. He himself has well described this change of method. He says: "Some have an unshaken faith in laboratory experiments, but the evolution of the feelings in time and space, through the centuries and among the races, is a laboratory whose operations have extended through thousands of years and on thousands of men, and of which the historical value is very great. It would be a serious loss to psychology to neglect these records. * * Though mental life has its roots in biology it only develops in society." It seems to me that this second part is even more interesting and original than the first. We find treated in it, in a manner to which psychologists are not accustomed, questions of great importance, such as that of the religious feelings. The chapters on the instinct of cruelty and on the moral feelings are models of clearness, conciseness and good sense. On the other hand, the first part suffers somewhat from the fact that systematic psychological investigation has not yet covered the field of the emotions. The account, for example, of the physiological effects of joy and sorrow, is injured by the confusion of the author, which indeed he shares with all his predecessors, between true and false vaso-constriction. I believe that this entire subject will soon be remodeled, thanks to the great extension in the use of the plethysmograph.

Let us now review briefly the author's chief theses. He has carefully described the effects of pain on the organism, holding that pain is a quality of sensation and not a sensation. He argues forcibly that pain does not consist in a state of consciousness; all the effects of pain may be observed in cases where consciousness is absent. There is not only an analogy between physical and moral pain; they are identical and the innumerable modes under which physical and mental pain are presented depend on the sensory or intellectual elements which accompany it. Psychological states include simultaneously elements of pleasure and of pain, and according to circumstances the one predominates over and inhibits the other. The product in consciousness is the result of the difference. Pleasure is not, as is often maintained, the opposite of pain.

In the following chapters, M. Ribot studies the pathology of pleasure and pain, including the enigmatical case of pleasure taken in suffering. A special discussion is given to neutral states, states of complete indifference, which are admitted by Wundt, and given an intermediate place between pleasure and pain, as transition states. Ribot, without expressly committing himself to one point of view or the other, holds that individual differences should be specially studied. Neutral states would seldom occur in nervous people who are in a state of perpetual excitement, they would doubtless occur much more frequently in the case of apathetic characters of limited intelligence. In concluding this general discussion of pleasure and pain Ribot takes up the two questions of the how and the why. As regards the former he maintains the general formula that the cause of pleasure is an increase of activity, and of pain a decrease of activity, but he also points out that this formula is very vague, and that the exact details of Meynert are highly hypothetical. In discussing the second question Ribot is equally cautious. Why is there a relation between pleasure and utility and between pain and what is injurious? The theory of evolution provides without doubt the best answer calling to its aid the theory of the survival of the fittest, but there are many exceptions to the rule which are difficult to explain. The relation between pleasure and utility and between pain and the harmful is a formula which owes its origin to philosophers. That is to those who always and before all else seek for unity.

After pleasure and pain the emotions are taken up, the general characteristics of which are depicted with care. Ribot accepts the

James-Lange theory, but in developing it, interprets it in a particular way. "James and Lange," he says, "adopt a dualistic point of view, like that of the theory they seek to refute, the only difference being in the inversion of cause and effect. In the one the emotion is the cause of which the physical manifestations are the effect, in the other the physical manifestations are the cause of which the emotions are the effect. In my opinion it would be a great gain to eliminate from the question all idea of cause and effect, all reference to causality, and to substitute for the dualistic point of view a unitary or monistic conception * * * * No state of consciousness should be dissociated from its physical conditions; they form a natural whole which should be studied as such. Each kind of emotion should be considered from this point of view; what movements of the body, vaso-motor disturbances, respiration, the phenomena of secretion, express objectively, the correlative states of the mind express subjectively. It is a single event translated into two languages." This is not the place to discuss this opinion, suffice it to say that it completely changes the conditions of the problem.

Under the name 'inner conditions' of emotion the author studies their physiological processes and under the name 'exterior conditions,' their signs and expressions. Darwin's theory is discussed but preference is given to that of Wundt. A very interesting chapter is devoted to the classification of the emotions. Ribot has selected a score of classifications made during a period of fifty years by well known authors, and divides these into three groups according to their character. The first group is a classification of the emotions as pleasurable and painful only; under the second group they are classed according to their empirical characters or according to their origin. group is an intellectual classification. Purely intellectual states are classed, and thus the emotional states that accompany them. Ribot rejects all the classifications because they are purely hypothetical and because the complex emotions cannot be arrranged in a linear series. Two chapters conclude this first part; the one on memory and the emotions had previously been published in the Revue Philosophique; the other is on the rôle played by the association of ideas in the development of the emotions and in the production of complex emotions.

With the second part the special analysis of a certain number of the more important emotions is taken up. Three emotions are correlated with the instinct of preservation: 1st, the emotions and instincts relative to nutrition; 2d, fear and its variation, repugnance; 3d, anger. Of each of these psychological states the author gives a very complete picture. He first indicates the physiological side of the subject, the

possible localization and the organic effects; he then gives a description of the emotions based on the testimony of consciousness; he traces their origin and development and concludes with their pathology. We may note, in passing, that the *phobies*, which constitute the pathology of the emotion of fear, are of two principal forms, fear, properly so called, and repugnance. The evolution of anger is traced with great felicity. It is made up of three necessary stages, a reflex of defense and of attack; anger, which is only a differentiation of this reflex; and hate, resentment, in which the same reflex is delayed and sometimes concealed. Hate is not the opposite of love, as has been so often maintained; hate cannot be a primitive emotion, because it includes the phenomena of inhibition, and inhibition is a complex and a late development.

The chapter on the affections contains a number of subtle and pertinent observations. The author treats the affections and sympathy together; he defines the latter as the keen representation of the emotional states of others and shows that this representation, if the affections are not included, does not suffice to constitute what in common language is called sympathy, or in other words, altruism. It is thus the affections which, added to the sexual instinct, constitute the foundation of love. In short, the greater part of the emotions are complex, they are derived from simple emotions, by evolution, by arrest of development and by the combination of several simple emotions.

Of the complex emotions the author reviews first the social and moral feelings. This chapter is well worth reading. It contains a classification of the principal kinds of societies, and a sketch of the feelings to which they give rise and the stages of their evolution. Ribot does not agree with many authors that the family is the primitive form of social union from which the clan and the tribe have arisen. He thinks that the tendency to live in society is irreducible and inherent and has developed independently of the family. There follows a complete exposition of moral feelings which do not arise, as claimed by the intuitionists, from an idea, from a formula (the categorical imperative). It is from the outset a spontaneous instinct, finding its expression in customs which later become conscious and reflective and are expressed in written laws and in the abstract speculations of moral philosophers. Further, this instinct of morality has two aspects, the first positive, corresponding to feelings of benevolence, the second negative, corresponding to those of justice.

The second part of the work closes with some chapters on religious emotions—treated with unusual wealth of detail—on the æsthetic

sense and on intellectual feelings, and lastly, two chapters (which had already been published elsewhere as articles) on normal and morbid characters and on the decay of emotions. A last chapter summarizes the leading ideas of the book. These are as follows: emotional manifestations are neither qualities of sensation nor of a confused intelligence; they are primitive facts prior to intellectual life. In the emotional life two elements should be distinguished, sensations of pleasure and pain, and the tendencies we call desires when they are accompanied by consciousness and appetites when they are unconscious. These are incipient movements prior to all experience of pleasure and pain. It is a blind force; "and this blind force, when it attains its object, experiences satisfaction and seeks for it anew because it is pleasant."

In conclusion I may say that in my opinion it matters little whether the reader can agree or not with the views of the author. Even those who dissent will find in this book what, at the present time, they will seek for vainly elsewhere, a place where all researches hitherto made on the emotions are brought to a focus. It is a fine testimony to the activity of French psychology.

A. BINET.

PARIS.

The Florentine Painters of the Italian Renaissance, with an Index to their Works. By Bernhard Berenson. G. P. Putnam's Sons. 1896.

This little book is a companion to the author's Venetian Painters and forms the second of a series of handbooks intended chiefly as guides to travelers in their artistic pilgrimage through Italy. In approaching the Florentine School, however, Mr. Berenson has not been able to avoid some philosophical discussion of the nature of the appeal made by these painters, and has given us a little sketch of an æsthetic theory, not without psychological interest.

The Florentines, he tells us, were preëminently figure-painters, and in this figure-painting they devoted their attention, not to color or sentimental expression or symbolic meaning, but to pure form. Now form has three dimensions, and to render the third dimension upon a flat surface is the chief technical problem of this art. Until this probblem is solved the figures are merely decorative or symbolical, and painting remains, so to speak, a literary art. It has the value only of an illustration. But when the painter, by his rendering of values, produces the illusion of bodily existence, and creates an imaginary space in which his figures live, he affords us a truly artistic pleasure. This pleasure may be greater than that of perceiving an object in ac-

tual space, because the indications of form, the values, may be emphasized in representation. Instead of the confused impressions which the actual object would probably send us, the painter strives to give us only the significant data, only those sensations which will help us to conceive the form, in all its complexity, as real and solid. The painter thus gives us a lesson in perception, and teaches us to appreciate bodily form and to enjoy it.

In the course of this analysis Mr. Berenson advances two opinions which, at least as presented here, without evidence to support them, must seem arbitrary and hasty to the psychologist. One is that the third dimension is perceived by association of the visual image with 'tactile' sensations, or 'muscular sensations inside my palm and fingers.' The influence of feelings of movement, apparently in the arms, is once mentioned, but the other possibilities in the case are ignored. The second opinion advanced is that æsthetic pleasure consists in stimulating to "an unwonted activity of psychical processes... which here, free from disturbing physical sensations, never tend to pass over into pain." A work of art, for those who are capable of enjoying it, heightens the intensity of the act of perception. It "overwhelms them with the sense of having twice the capacity they had credited themselves with; their whole personality is enhanced" and they 'feel better provided for life.'

It would be manifestly unfair to criticise these opinions as if they represented the author's complete theory of æsthetic values. But his views are worth considering as indications of the direction in which an intelligent connoisseur looks for an explanation of his own judgments. He looks for it in the act of perception itself, in an acceleration of the process by which the conception of a physical reality is gained. While we may pass over the illustrations of this principle which Mr. Berenson comes upon, and which are chosen, perhaps, somewhat at random, we must welcome the attempt, on the part of a professional critic of art, to trace æsthetic pleasures back into the primary processes of sense and imagination. Such an attempt is a proof of directness and vitality in the author's criticism and at the same time it is an encouragement to the psychologist who might fear to miss the essence of the higher artistic feelings while digging in the psychophysical field. It is there, Mr. Berenson tells us, that those feelings have their roots.

The painters whom he reviews would generally have agreed with him; for it is not the artists themselves, or those who have a technical appreciation of art, that repel an interpretation of its effects as immediate and physical. The opposition comes rather from those who, without specific training or sensibility, find in art only a general stimulus to their vague, heterogeneous emotions. To such persons the significance or use of art lies in the ideas, moral, religious or sentimental, which it suggests to them and which alone they are capable of feeling strongly. But the artist, in whom perception is vivid and accurate, and who is ready to understand its marvelous complexity, finds meaning and value in the forms themselves, apart from extrinsic associations.

The opposition between these two points of view is, indeed, not fundamental. A man like Michael Angelo may well combine them, since he had capacity enough to feel to the utmost both the beauty of bodily form and the tragic and religious burden of life, so that he could give his visions the greatest plastic reality while he kept his soul strained towards the highest moral ideals. But these interests are independent, and it was perhaps the desire to identify them, and the despair of doing so, that made the art of Michael Angelo in a way swollen and sad. For, as Mr. Berenson says, the Florentines were not merely painters; they were men of varied gifts and general interests who found in painting only an occasional and partial means of expression.

G. Santayana.

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Manuale della Semejotica delle Malattie Mentali. Guida alla diagnosi della pazzia, per i medici, i medici-legisti e gli studenti. Vol. II. Esame psicologico degli alienati. Enrico Morselli. Milano, Vallardi [1896]. 12°. Pp. xviii, 852.

Of this thick volume perhaps five-sixths of the pages are in fine print. It forms, consequently, the most thorough and minute analytic symptomatology of insanity in existence. I say analytic, because, although the author divides it into 'synthetic' and 'analytic' halves, it yet deals solely with separate and elementary symptoms, and nowhere touches on those complex aggregates of symptoms that make up the various types of insane personality. The result is a book rather for reference than reading. Whoever wishes to find everything that can possibly be said about a given function, such as physiognomy, language, conduct, perception, memory, will, etc., in the insane, can do no better than consult its pages. At the same time the very completeness, largely brought about by filling to their utmost all the compartments of an exhaustive scheme marked out in advance, is more mechanical than practical. We doubt, for example, whether such an

experimental examination of 'consciousness' as that for which directions are given on pp. 735-765 can ever be applied by an asylum physician to a single patient. It includes determinations of the acuteness and range of the various senses, and of Weber's law as applied to each of them; chronometric determinations of the rhythmic oscillations of the attention; ditto of the simple and the variously complicated reaction-times, with their disturbing conditions, again applied to all the senses; measurements of the area of the conscious field by the Wundt-Dietze method; observations on automatic movements subconsciously performed when the attention is distracted; exploration of the patient's suggestibility under hypnosis; and finally, of his subjective consciousness of altered personality, or the reverse. First and last we get almost the whole of Wundt's Physiological Psychology, and the author may well speak in his preface of the great labor he has thrown into his work. An Englishman or a Frenchman would have lightened the burden by throwing out much of the only hypothetically practical matter. Prof. Morselli's book is, in fact, only one more instance to add to the number which prove the affinity between the Italian and the German turn of mind. His style is better, but his learning is as ponderous, and his multiplication of Greek terms as great as that of any Teuton-e. g., hyperpraxia and hypopraxia for the over-activity and inertia of mania and melancholy, and no end of dis-es, such as the various species of disnoesia, namely, disesthesis, disgnosia, dismnesia, disfantasia, dislogia, etc., etc.

But all this does not detract from the solid value of the matter contained in the volume, or from the author's good judgment when, instead of enumerating facts, he pronounces opinions. His pedantry entirely breaks down, e. g., when speaking of the methods of the 'exact anthropological school. Except as a disease of central organs involving the conscious self, insanity is unintelligible. "What has so far been explained with respect to the genesis and forms of mental disease by all the measurements of cranium and stature, by all the sphygmography, the urine-analysis, even by the dynamometry and æsthesiometry, of which so many of the followers of objective empiricism boast, and which they confound with the true experimental method? I have read with the greatest serenity all the histories of cases that come coupled with this address. But, arrived at the end of the somatic and physiological inquest, and at the beginning of the psychological examination, I have always had, when it was a question of the primary forms of mind-disease, the impression of an absolute cleft and utter lack of connexion between the two examinations * *

* I conclude that, whilst still granting to anthropology and nerve-pathology the confidence they well deserve, we must restore

psychology proper to its rights" (p. 21).

One of the things that most strikes me in Prof. Morselli is his contempt for the absoluteness of the accredited 'types' of psychosis ordinarily named and recognized. Individuals are types by themselves, and enslavement to conventional names and their associations is only too apt to blind the student to the facts before him. "The more I study and examine the insane, the profounder grows the conviction in me that the purely symptomatic forms of our classifications are based on the expressive appearances which insanity assumes according to the temper and pattern of the subject whom it affects. In short, individual subjects operate like so many lenses, each of which refracts in a different angular direction one and the same ray of light" (p. 143). Elsewhere (p. 53) Prof. Morselli writes: "Many forms of insanity which the nosographs distinguish and circumscribe within sharp limits are, despite their apparent divergence, only clinical varieties or different stages of a probably unique malady which is modified diversely according to the personality of the individual whom it affects."

Unfortunately we are carried no farther by the author along this curiosity-exciting path. W. J.

I Sogni e il Sonno nell'isterismo e nella epilessia. Dott. Sante de Sanctis. Roma, Sociéta Dante Alighieri, 1896. 12°, Pp. 216.

An inquiry into the manner of sleeping and dreaming in 98 cases of hysteria, 45 being of the light, and 53 of the grave variety; and in Q1 cases of epilepsy, of which 25 were inveterate and showed intellectual decay, whilst of the remaining 66 fresher cases, 45 had 'classical' attacks, whilst 21 were of petit mal. The amount and depth of the sleep were noted, as well as the frequency and character of the dreams, and their relation to the phases and incidents of the malady. The work is carefully done, and contains a very complete reference to the literature of dreaming and sleep. The minuter statistical details must be seen in the original. The main results are that hysterics and the lighter epileptics sleep badly, but the better the older the case. In epilepsy with grand mal the sleep is good. Sleep-walking (contrary to a common opinion) is rare in both diseases; sleep-talking is frequent. 'Abrupt awakening, and hynagogic hallucinations, are common in both diseases. Nightmare (incubus) also; but the more so in epilepsy, in which it tends to disappear with age. As for the dreaming, age and repeated epileptic attacks seem to make it less frequent as well as less

easily remembered. The dreams of epileptics are simple, those of hysterics complex and dramatic, and often 'macrozooscopic.' One of the most interesting points connected with the dreams of hysterics is their influence on their waking life and course of the symptoms. Dr. de Sanctis found this influence; but only in 6 of his cases did it seriously aggravate the disease. In more than half the cases the dreams of the previous night influenced the humor and conduct of the following day.

W. J.

SUBLIMINAL CONSCIOUSNESS, ETC.

Subliminal Self, or Unconscious Cerebration? ARTHUR H. PIERCE. Proceedings of Soc. for Psych. Research. Vol. XI., pp. 317-325. (1895.)

Reply to the same. Frank Podmore. Ibid., pp. 325-332.

Ueber Spaltung der Persönlichkeit (Sogenanntes Doppel-ich.)
DR. FREIHERR VON SCHRENK-NOTZING. Wien, Holder, 1896.
8°. Pp. 23.

Die Mehrheit geistiger Persönlichkeiten in einem Individuum. Eine Psychologische Studie. Dr. S. Landmann. Stuttgart, Enke, 1894. 8°. Pp. 186.

The well-known observations made on hypnotic and hysteric subjects and automatic writers by Gurney, Janet, Binet and others, and which by their authors are supposed to prove that mutually disconnected currents of conscious life can simultaneously coexist in the same person, are subjected to critical reinterpretation by Messrs. Landmann, von Schrenck and Pierce. All these writers deal with theory, no one of their essays bringing out any new kinds of facts.

Mr. Pierce thinks that the performances, such as the executing of orders, answering of questions in writing, etc., that may go on whilst the subject's upper consciousness ignores what happens and is otherwise occupied, are all due to unconscious cerebration. Educated to certain aptitudes, the brain is now able to perform them whilst its consciousness is altogether engrossed with other conduct simultaneously going on. The notion of multiple consciousness has no limit if we begin to use it. There is no direct proof of the supposed split-off consciousness, for by the hypothesis, if split off it is never known to the 'person,' and if remembered later it was probably not split-off.

Mr. Podmore objects that Mr. Pierce talks as if consciousness and brain-processes formed an alternative. He himself favors the parallelistic theory and considers some consciousness to accompany all processes, its degree fluctuating; he disbelieves in two disconnected systems of consciousness forming a definitely *dual* control, and thinks the facts best covered by the conception of a conscious field with a single bright center and a margin stretching indefinitely away into twilight.

Baron von Schrenck holds somewhat similar views. He believes that only those processes that form the 'crest of the wave' of cerebral excitement give rise to full consciousness. But the wave-crest is always shifting its place; and a system of cerebral operations, A, started with full consciousness, can run on for a certain time, even although the wave-crest may forthwith have proceeded elsewhere and started another system, B, which latter then in its turn may run on sub-consciously, whilst the wave-crest reverts to the now subsiding system A, and with a stroke of full consciousness starts it up to activity again. We have only to suppose, now, that the pulses of conscious attention that accompany the A-process and the B-process severally, as the wave crest oscillates to and fro, fail to combine into a united memory system, and we have, according to von Schrenck, all the phenomena of simultaneous double self, so-called, or split consciousness, explained on the type of alternation of systems of ideas with the memorybridge between them gone. The theory of simultaneous coexistence of fully conscious systems thus falls to the ground.

Dr. Landmann accounts for the facts by assuming three levels of brain-operation, only one of which has self-consciousness attached to it. This latter is the consciousness of psychic activity as such. It is attached exclusively to certain (undesignated) processes in the cortex, and only he who has it can say 'I.' The second level is that of ideation and association without this self-consciousness (unselbstbewusste Vorstellungen); whilst the third level belongs to the 'subcortical centers' and is often spoken of as 'unconscious' by Dr. L., though he also repeatedly speaks of the Vorstellungen and Gefühle that go with the subcortical centers. Whole groups of cortical cells can fall into isolated activity; the subcortical cells can act by themselves, and the cells of self-consciousness can either cooperate or not coöperate with the rest. But the self-consciousness is either wholly where it is, or else not there at all; so that the ordinary talk about fractioning of the personality, upper and lower selves, etc., is absurd, 'personality' and 'self' being indivisible elements of the mental life. The only possible doubling of the self is where it acts in alternation, first with one and then with another system of ideas.

Where one self appears to be writing automatically whilst another

self converses at the same time through the mouth, the latter self is the sole real self engaged; the automatic performances being the work of the 'non-self-conscious' parts of the cortex, and of the 'unconscious' basal ganglia. Dr. L. applies these principles in an intolerably rambling style and with tedious minuteness to the elucidation of Janet's and Binet's observations, thinking (strange to say) that their merely descriptive phrases about 'dissociation of the personality,' etc., consitute a 'theory' irreconcilable with his own.

The really urgent problem in these phenomena of split or uncoupled mental life is that of the conditions of splitting and coupling-again, be they cerebral conditions or physical conditions, or both. What happens when any one system of ideas or of brain activities get so thoroughly shunted off and ignored by the consciousness that goes with the rest? On this problem no one of our three authors can be said to throw any more positive light than Mr. Myers or Janet. Myers would be the first to say that his phrase 'subliminal self' is only a temporary noun of designation for a certain group of facts. Janet would say the same of his phrase 'defective power of conscious synthesis.' But their three critics, each with his own notion of a unique activity of self-consciousness which cannot be split, seem to me to carry matters backwards rather than forwards, and to tend, if anywhere, towards a somewhat pre-Lockian and non-empirical point of view.

W. J.

Introduction to Philosophy. F. Paulsen. Translated by F. Thilly. With an Introduction by W. James. New York, Henry Holt & Co., 1895. Pp. xix+437.

Professor Paulsen's Introduction has been in the hands of the students of philosophy in the original long enough to have become familiar. To those who have not known the original, Professor James' preface will be sufficient recommendation. The features of the book which strike the present reviewer may be briefly indicated. First, the readable character of the author's expositions is noteworthy. Then the comprehensiveness of the book is surely a great recommendation of it for class-room work.

As to doctrine, several things are striking. Professor Paulsen's 'voluntaristic' psychology gives character to his philosophical views all the way through (see pp. 313, 320 f.), and it is this standpoint, possibly, that leads him to subordinate the problem of epistemology, as he does, to that of philosophy in general (pp. 349, 353). But the tendency

of the book which gives it its most prominent character is what may be called its 'animistic' view of nature (99 ff.)—in a good sense. Paulsen goes the length of finding a 'world-soul' to be more than a figure (107 ff.). His arguments for it seem to be inconclusive as other arguments recently urged in the same direction (e. g., the interesting theorems of Professor Royce). The argument of Paulsen, based, as it is, on analogy, for some sort of subjectivity in connection with the life functions, has great force; but when a similar argument is carried over into the inanimate world it gives occasion for a good deal of stumbling. Then, when Professor Paulsen goes on to appropriate the term 'pantheism' for his doctrine, he seems to open himself to a sort of criticism which Lotze avoided by avoiding this term, although his view was perhaps as near traditional pantheism—or as far from it—as this of Paulsen.

It is curious, but there seems to be in many a tendency to a sort of mysticism in conceiving the sort of 'world-ground' which modern philosophy is reaching after. We go the length of a 'monism,' call it theism, hope the absolute is 'personal,' and yet shrink from an animistic view of nature. Perhaps Professor Paulsen's frank acceptance, both of the latter doctrine and of a much abused name for it, will tend to convince some readers that this course is better than the sort of vague mysticism in which we have been resting. But yet it seems to me that the final doctrine of the absolute will have to accept the distinction between consciousness with its experience, and mechanical nature with its law, and find a more profound way of justifying an ultimate monism than the simple way of reading into the minerals a form of experience which directly contravenes the distinction. In other words, the final synthesis of metaphysics would seem to be rather logical, as going beyond the distinctions of experience, than material, as being justified by positive agreements in experience. And just for this reason, the older method, which makes a critique of experience a preliminary problem, would come in to get its justification.

The book is the best thing we have in English, its matter is very modern, its historical expositions wonderfully illuminating, its divisions flexible, and its style direct. The only criticism I should make as a teacher is that foreshadowed above, that for an introduction it teaches a philosophy too directly. But then, that is what the author set out to do. The translation is accurate and idiomatic, but possibly rather too literal.

J. MARK BALDWIN.

Schopenhauer's System in its Philosophical Significance. WIL-LIAM CALDWELL, M. A., D. Sc., Professor of Moral and Social Philosophy in the Northwestern University, U.S. A., etc. New York, Chas. Scribner's Sons, 1896. Pp. xviii+538.

If anything can justify philosophical scepticism it is the present status of Schopenhauer. To some his thought represents the highest flights of speculation, its nearest approach to that ultimate essence of Nature which has been the *ignis fatuus* of philosophy since the days of Thales. To others his system, if system it may be called, is merely the futile attempt of a brilliant but ill-regulated mind to comprehend the world in which it lived and to evolve from its own discord practical principles for the guidance of more happily constituted souls.

With the latter position Professor Caldwell has no sympathy and, although in his preface he says that he has tried 'to strike a mean in the matter of the connection of Schopenhauer's philosophy with his personality,' he seldom recurs to the topic in his subsequent chapters, and when he does so fails to call attention to the most salient peculiarities of Schopenhauer's very peculiar temperament. Schopenhauer is, to him, a philosopher of profound significance. In shifting the object of philosophic contemplation from thought to will, from the logical necessities of the Hegelian dialectic to the concrete sequences of nature and the terrible realities of human passions and ungratified desires, he has given philosophy a status in the modern world which it never had before and which it will never lose. So deeply is Professor Caldwell impressed with the importance of this step that he tacitly ranges himself in general on Schopenhauer's side and speaks with sympathy of his views even when he feels compelled to differ with them. Yet he is in no sense a schoolman. Thoroughly as his own thought has been modified by reflection upon Schopenhauer's teaching, he shows no tendency to adopt without careful criticism and appreciation, and this very fact, which gives his book its chief philosophic value, makes it difficult for one who, like the present writer, possesses only a general acquaintance with Schopenhauer's writings, to discriminate the elements which are drawn from Schopenhauer from those which are due to the author's own reflection. The form of the book greatly increases this difficulty. Professor Caldwell makes no attempt to give a clear and adequate view of Schopenhauer's doctrines as he himself apprehends them and then to indicate the points in which they stand in need of revision or completion. In the opening chapter, 'A General View of Schopenhauer's Significance,' he touches upon the chief points of contact between Schopenhauer's thought and that of his age;

Chapters II. and III. deal respectively with his 'Idealism' and his 'Theory of Knowledge;' Chapter IV. with the 'Bondage of Man;' Chapters V. and VI. with his 'Philosophy of Art;' Chapters VII. and VIII. with his 'Moral Philosophy' and 'Philosophy of Religion;' Chapter IX. with his 'Metaphysic;' Chapter X. with 'the Positive Aspects of the System,' and these are followed by a brief 'Epilogue,' or resumé of the leading conceptions of the book. This arrangement gives rise to an amount of repetition and an expansion of relatively few thoughts into scores of pages which might have been desirable in the series of lectures upon which the book is based but is most unfortunate in a book. Chapters II. and IX., Chapters III. and Chapters IV., VII. and VIII., deal with approximately the same material respectively and might have been condensed into smaller space with advantage.

Professor Caldwell frankly adopts Schopenhauer's fundamental conception that the essence of Nature is will, striving, or effort, but, instead of following him in his assimilation of the ultimate Will to the blind forces of Nature, he tends to assimilate it to the highest manifestations of self-conscious will as found in man, or rather vice versa, man's will is, of all that lies within the range of his experience, the most faithful representative of the archetypal essence. Man's thought and discursive reason can be understood in a teleological sense only. It can serve to mirror his present environment and to throw a feeble and flickering light upon his path, but it cannot portray to him his true being or that of the Universe, nor can it enlighten him as to the ultimate end towards which the World Will, as manifested in the phenomena of Nature, and in his own blind longings and inner strivings as well as in his deliberate volitions, is leading him. With Schopenhauer's 'illusionism and confusionism' Professor Caldwell has no sympathy. Schopenhauer had himself only half learned the lesson which it was his mission to teach the world. He had grasped the familiar truth of idealism that there is no ultimate difference in essence between the subjective and objective sides of experience, but he had failed to see that reality is not to be sought outside experience, although it is not to be found in all its fulness within experience. Since Will is the essence of reality, the most complete revelation of reality in experience must be sought in those forms of experience which at once most fully satisfy the cravings of man's will and presage a still fuller satisfaction yet to be found. Such are the realities of Art, of Ethics and of Religion. With that recognition Schopenhauer's unwavering conviction of the truth of those realities finds a justification which he

was never able to provide, the disappointments inherent in human life find their place in philosophy, but philosophy does not thereby become a system of pessimism and illusionism.

It would seem therefore that, although Professor Caldwell seldom or never uses the word 'God,' his interpretation of Schopenhauer brings us back to the familiar conceptions of philosophical theism, save that the Divine immanent in things is to be conceived rather in an active than a passive aspect. The life of the Ultimate Being is not a mere contemplation of its own perfection, as the older philosophers thought, but a constant endeavor towards the perfection of its creatures.

If I have failed to grasp the essence of Professor Caldwell's thought it is not from any lack of grace in its expression. Schopenhauer himself never wrote more charming pages. Like him, Professor Caldwell has caught the secret of good style; his reader's attention is spontaneously arrested by the transparent clearness of his thought and is free to follow and enjoy its development without voluntary effort and without fatigue.

Altogether the book is one of the most attractive and interesting that has appeared in recent years. The author, it is true, takes Schopenhauer somewhat more seriously than some of us are inclined to do, but such fundamental differences of opinion as to the relative value of philosophic methods, and their probable fruitfulness in the production of sound knowledge, are not profitable subjects of discussion and should not be made grounds for criticism.

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Moral Evolution. By George Harris. Boston and New York, Houghton, Mifflin & Co., 1896.

The title of Mr. Harris's book, 'Moral Evolution,' shows his main idea, viz.: that there is no conflict between evolution and ethics. Positively, he traces the harmony of the two along three lines: (1) evolution is recognized only when its results are known, and ethics is essentially a science of ideals; (2) both have the same material—self-regarding and other-regarding feelings—which are equally natural and are harmonious though not identical; (3) both are alike in method, there is gradual progress (Chaps. I., VII.).

Historically, this progress has consisted in the development of personality, that is, in the increasing participation of the individual in social functions. Pain and struggle lead to this; perversion or wrong

is only an incident. Theologically, the ideal is the same as that given by history—" the person having the powers with which he is endowed and cultivating them in their true proportion and symmetry into the perfect character" (p. 71). This ideal is not identical with happiness, but in the long run ensures it.

The ideal of the good is the content or dynamic side, which determines the right or the ought, the formal or static side. The sense of obligation is what distinguishes man from animals. Its origin, Mr. Harris does not know. He has leanings towards some kind of instantaneous creation. But however it got here it will stay, he is sure, as long as man has ideals. But again, the distinguishing characteristic of man is said to be his 'recognition of the relative worth of the higher and lower goods of persons.' I do not see the relation between these two 'distinguishing characteristics.'

The transition from morality to religion is made by the reflection that since the outcome of evolution is rational man the process must be rational, and therefore implies God both historically and ideally. Further, if God is rational, He must be perfectly righteous, for if He were not, and yet imposed good on man, He would be arbitrary, which is contrary to the assumption.

The bearing of the last half of the book, on religion and theology, is not clear to me. The author seems to have abandoned his starting point of moral evolution and to be engaged with the idea that evolution having got us on so far it may now be dispensed with (as a principle) and a fixed moral content substituted.

The principal criticism to be made on the book is that its fundamental terms are either not defined or the definition is arbitrary. Thus, when the personal ideal is defined, the crucial phrase is 'cultivating man's powers in their true proportion.' What this true proportion is we are left to surmise, until in the last of the book we run across the statement that Christianity alone gives the true proportions. But Christianity in turn needs defining. Is it that of the gospels or of the churches of to-day? And if any special period is taken, how do we know of its finality?

Again, such terms as 'higher' and 'lower' goods are used, but are defined only by implication. I infer that by 'lower' goods are meant such things as food, clothing and shelter, but in an ideal of unified activities, such as has been given here previously, such distinctions are not valid, and if 'lower' is used in opposition to 'higher' it ought not to be labelled good.

The use of the terms good and bad is also as unsatisfactory as

usual. In the terms of evolution, good is the normal, and bad the abnormal. But the question comes up, as always, how in any specific case can we know which act tends to the normal? As a rough and ready rule past experience may serve, but history never repeats itself. Life is a series of experiments. There is always a new element which makes the outcome of each venture uncertain, and hence the judgment of good or bad can be passed only after the act is done, and no standard is final in advance.

This element of newness is so characteristic in the idea of evolution that questions again arise concerning the relations of the moral and religious parts of Mr. Harris's teaching. He asserts, for example, the finality of the contents of the life of Jesus as the moral ideal, as well as of its method or spirit. Given evolution as a moral, not simply a physical, fact and it would seem to follow that if the spirit of Christ's life was perfect when lived, then it would require a different setting and content in order to be perfect if lived to-day. Or, again, and this is the point which we should expect Mr. Harris to insist on more, Christ may have been perfect in the sense that He embodied the law of all development. In that case the specific acts of His life are of no importance whatever, and would vary infinitely according to time and place. The unity of His life with that of the world constitutes His divinity and oneness with God.

This leads us to a consideration of Mr. Harris's idea of God—another term which is not defined. At times the term is used as if God were apart from the world, molding it to His will, perfect before it existed; and, again, as if God were inseparable from the world. It is argued that because the outcome of evolution is rational man, therefore the process must be rational and therefore it implies God.

I will merely point out here that the process might be rational without implying God, unless by God is meant simply reason in the world, without regard to whether this reason is or is not distinct from matter; and further, that logically there is no more need of imagining a creator of mind or reason than of imagining a creator of the creator of reason. The category of causation can not in any case be applied to the totality of experience, because it is a helpmeet within experience.

On the positive side, the book is valuable for the emphasis which it lays on the inter-action between the individual and society and their mutual dependence. The favorite illustration of the ellipse whose foci are the individual and society, both of which determine the curve at every point, is very striking. Another point also worth mentioning

is the constant assertion that self-regarding impulses are just as moral as other-regarding ones, and that the two are not antagonistic. I can not help regretting, from the standpoint of ethical science, that Mr. Harris did not work out these points more fully instead of devoting his energies for more than half his book to an exposition of the truth of Christianity which is so generally granted that it is not needed.

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ETHICS.

The Relation of Intuitionism to the Ethical Doctrine of Self-realization. HENRY CALDERWOOD. Phil. Review, V., 4, pp. 337-351. Intuitionism claims that the principles of conduct are given immediately by the reason, and are not the product of induction. Opposed to it are Utilitarianism and the system of Self-realization. Mr. Sidgwick, for the former, while criticising it for its lack of scientific precision, is yet forced to admit that an intuitive operation of the practical reason seems to be somewhere assumed in all moral systems. Does the theory of Self-realization offer us a better explanation of the facts? There are two phases of this theory, the high idealistic position of Hegel and Green, and the more humble position of the rational psychologists. They must be tested with reference to the knowledge of the law and to the end of action. The former phase of the theory is mainly metaphysical, and according to Green's own confession can give us no adequate account of what man's true self should be. How do we know what is right? The divine mind 'reproduces itself in the human soul,' says Green. This is really Intuitionism. The rational psychologists give us no clearer account of the process by which we reach a knowledge of moral truth. They insist that Self-realization is the end of action, but do not tell us clearly how we know what the true self is. We learn it, they say, by considering the process through which the institutions and rules of life have arisen out of the effort after an ideal, and have in their several measures contributed to its realization. But conscience is superior to institutions, and we need a philosophy of our knowledge of the inner law, without which, institutions and rules, and the objective ethical world itself, are inexplicable. Considered with reference to the end of action the theory of Self-realization is also inadequate. Thought must be self-centered as belonging to our consciousness, but the law of right conduct, and the motive for well-doing, and the end for which we live, all out-stretch self-satisfaction.

Morality the Last of Dogmas. Antonio Llano. Phil. Review, V., 4. pp. 371-394.

The thesis of this article is that "in the course of time all moral feelings (those, that is, involving such ideas as obligation or compulsion, duty and the like) will disappear from the human mind and cease to have any influence upon the further development of the race." The basis for this belief is to be found in a knowledge of the nature and origin of conscience, and in the modern scientific conception of the world. Conscience is merely an abstract feeling of fear of punishment, and its origin is to be sought in the primitive conception of nature as an aggregate of superhuman beings, to whom man was responsible. Morality arose from this fear of external power. The modern tendency is toward individual freedom, hence the idea of compulsion or obligation must pass away from morality. There can be no reason why my individual feelings should form a standard for any one else. Moreover, the naturalistic or deterministic conception of the world must work toward the same end. Man's conduct is only a phase in the transformation of an infinite and eternal energy, and is no more subject to praise or blame than is the course of the stars. We cannot demand that a man should be other than his conditions have made him. Moral good and evil are meaningless terms.

Determinists have shrunk from these conclusions, and this has been urged as an argument against their theory, but two psychological laws explain the inconsistency between their theory and practice. First, action ultimately depends upon feeling, not upon judgment alone; second, a feeling which has become organic through heredity cannot be suddenly eliminated, even though reason has destroyed its basis. Hence we cannot expect the deterministic theory to change our moral feelings even after several generations have accepted it. Nevertheless, the growing sentiment of tolerance in religious and political matters is in reality a sort of movement towards what may be called moral indifference—toward the time when no man will condemn another for thoughts, feelings and conduct which are the necessary product of his organization and environment.

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VISION.

Ueber den Einfluss von Lichtstärke und Adaptation auf das Sehen des Dichromaten (Grünblinden). J. v. Kries und W. Nagel. Ztsch. f. Psych. u. Phys. der Sinnesorgane. XII., 1-38. 1896.

It has long been known that by mixing in the proper proportion light from the two extreme ends of the spectrum an absolute match can be obtained, for the eye of the partially color-blind, to every color sensation which it is capable of receiving, and in particular to every homogeneous light throughout the spectrum.1 Soon after the obtaining of the first exact results of this nature, it was announced by König that the equations in question are not independent of the absolute intensity of the lights employed, that an equation which has been obtained at a high intensity no longer holds when the lights are turned down. The same variations were found to hold for the color-equations of trichromates as well, and they are summed up under the phrase 'departures from Newton's law of color-mixture;' the facts were absolutely denied by Hering, who said that if they were established it would be equivalent to an entire upsetting of the constitution of the universe, but they have been fully confirmed by other observers and are now admitted by Hering also.

The facts here referred to have lately won an additional interest on account of the present theory that the cones are the bearers of the color-sense and that the rods convey the colorless sensation only. König's observations have been criticised by Hering on the ground that he worked with too large a field, and hence that he did not avoid an irregular effect of the yellow pigment of the macula, and also that he did not give sufficient attention to the adaptation-condition of the eye. In order to meet these objections, and also for the purpose of having the observations confirmed by one more observer, Nagel, who

¹The quality of the entire gamut of sensation throughout the spectrum for the color-blind is either yellow, or blue, or gray, and nothing more. It is not true, as is commonly supposed, and as is stated, for instance, in the Century Dictionary and in Johnson's Cyclopædia, that there are some who are redblind, but have the sensation of green, and others who are green-blind, but have the sensation of red; this erroneous belief had its origin purely as a deduction from the Young-Helmholtz theory of color-vision (if there were three fundamental color-processes, red, green and blue, a partial loss of color-sense would naturally consist in a defect in one of these processes), and it is a lasting monument to the folly of making deductions from unproved hypotheses and then forgetting that the deduction has the same hypothetical character as the premises from which it was deduced. The true state of the case was first discovered by William Pole, F. R. S., in 1857, by reflections upon his own sensations (he was himself a dichromate, who did not discover his own defect until the age of thirty), and his result, for which he has never received due credit, is one of the most brilliant products of the application of pure reasoning to an apparently hopelessly confused mass of facts that has yet been witnessed. His conclusion has been abundantly confirmed by the cases of color-blindness in one eye only that have since been detected, the first being that of Becker, in 1879.

is a dichromate, has repeated the experiments, with various modifications, upon himself. The splendid color-mixing instrument, originally designed by Helmholtz and perfected by König (made by Schmidt & Hänsch, of Berlin) was employed; this is the second instrument of the kind, of any value, that has been constructed. It is of much less complexity than that used by König himself, but it was found to answer the purpose for these experiments. The field offered to the eye of the observer was two degrees in diameter; its middle point was fixated, and the eye was kept constantly adapted for brightness. cipal difference between the yellow and the blue curve obtained by these observers and those given by König for the same colors is that in the present case the blue curve extends only to \$536 instead of to 1600 that is, overlaps the yellow curve much less, which means, in other terms, that the yellow in the immediate vicinity of the gray line of the dichromate's spectrum was much more fully saturated than König found it to be. This difference is readily explained by the fact that the field was here small and constantly central. means the participation of the rods in the sensation produced was almost wholly excluded, and the curves represent more exactly the visual process as it takes place in the cones alone. The discrepancy was greater here than in other parts of the spectrum because the conesensation reaches here a maximum of intensity. Another criticism which Ebbinghaus has brought against König (that the blue curves do not show sufficient coincidence for the dichromate and the trichromate) is fully met by the same consideration. At the same time it should be remembered that whether the addition of a small amount of blue is or is not necessary to effect equal saturation in the two halves of the field is a difficult observation to make; the 'equal amounts' of red and blue which go to make a pure gray are not equal in respect of brightness, but equal in color-quenching power, to use the appropriate phrase of Helmholtz—the red unit is in fact as bright as twenty times the blue unit—and such small quantities of blue as this are naturally difficult to measure.

The next step was to redetermine the distribution, throughout the spectrum, of the colorless sensation of the dichromate in a faint light, the twilight sensation, as v. Kries has happily named it. This was found to be sufficiently in coincidence with the same curve as found by König, after making allowance for a possible slight difference in the quality of the gas used, and Hering's curve is also the same, after reduction from daylight to gas light. The red end of the spectrum was found to be faintly visible as gray, if it was looked at sufficiently at one side of the fovea.

Since v. Kries' results agree with those of König as regards the two elements of the comparison, they naturally agree with them as regards the conclusion. According to the ideas of Hering, two lights which are equivalent at an ordinary intensity must have an equal white valence, or, since that is the same thing as their twilight-values, these also must coincide. But that is very far from being the case; the mixture from the two ends of the spectrum, which is for the dichromate absolutely indistinguishable from an homogeneous light in the yellow green at an ordinary intensity, needs to be made more than a hundred times brighter to match it in a faint light. And what Hering has considered to be possible sources of error in the experiment have here been entirely done away with. It follows that it is an absurdity, upon practical as well as theoretical grounds, to speak of a brightness of a color as being due to the brightness of its colorless component.

Ueber die Wirkung kurzdauernder Lichtreize auf das Sehorgan. J. von Kries. Ztsch. für Psychologie u. Physiologie der Sinnesorgane, XII., 81-101. 1896.

A large number of observations have been made lately on the subject of the secondary image which follows a brief excitation of the eye by a rather strong light. The phenomenon was noticed by Purkinje, who noticed everything; it was rediscovered by Professor C. A. Young, and the most detailed experiments upon it have been made by Hess, and especially by Bidwell, by whom it has been called the recurrent image. The observations upon it have been of a very conflicting nature; it is usually stated to occur one-fifth of a second later than the primary image, but Exner found no interval at all. In color it has been described as complementary, except by Hess, who found it to be of the same color. Bidwell and v. Kries discovered at about the same time that it fails to occur after excitation by red light, and v. Kries has now observed that it is also altogether wanting in the fovea; these two circumstances point strongly to the influence of the now commonly accepted difference of function of the rods and the cones of the retina, and consequently a study of the effect upon it of adaptation-a change of condition which takes place chiefly in the rods and which is without doubt a function of the visual purple—was very desirable. This v. Kries has now carried out; his method was similar to that of Bidwell, and consisted in allowing a spot of spectral light to fall upon a mirror which rotated upon an axis not perpendicular to its surface, and from that to be reflected to the eyes of the observer, who perceived a bright spot moving about a central point of fixation. Under

these circumstances the ghost was very distinct, of complementary color to the primary image, and at a distance from it which translated into time was equal to one-fifth of a second, so long as the eye of the observer had not been adapted for darkness; the constant darkness adaptation of the eye was maintained, since the walls of the room were black, by frequently looking out of the window. The first image is sharply defined, not quite circular, but rather cylindrical, with a concave edge behind; the second gradually fades off in a faint trail, and its head is surrounded by a circle of more than ordinary blackness. But if the light is very intense, so much so, for instance, that the trail stretches out through the entire circle, then the first image is also much longer (this is, no doubt, the ordinary positive after image), and becomes joined on to the secondary image; this is the form in which Exner saw the phenomenon—without any interval.

If the eye has first suffered complete darkness adaptation (that is, has been kept in the dark for two hours, at least), the appearance presented is very different; the secondary image is of a brilliant white, and it appears almost immediately after the first image, which is consequently in shape more like a slender crescent. The secondary image, in one or the other of its two forms, Professor v. Kries very properly takes to be at least the principal cause of the phenomenon of the fluttering heart. Both forms alike vanish when the real image goes through the central part of the retina. One observer said that it seemed as if they slipped into a tunnel. The area of this ineffective space was about 35 by 38 mm. at a distance of 1 m. from the eye, which corresponds very exactly with the size of the space which is practically free from rods.

From various attendant circumstances, Professor v. Kries is forced to assume that there are two distinct reactions of the rods, not simply one reaction which takes place after adaptation both with greater force and with greater promptness. He suggests that one may be due to visual purple in the rods, and the other to that outside of the rods, assuming in both cases that the visual purple is a true visual substance, whose product of decomposition excites the nerve end.

C. LADD FRANKLIN.

BALTIMORE, MD.

Theorie des Talbotschen Gesetzes. Von Karl Marbe. Wundt's Studien, XII., Heft 2, pp. 279-296.

The general statement of Talbot's Law is as follows: If two light stimuli successively and periodically excite the same point on

the retina there will result either a series of separate sensations or one single sensation of a constant intensity and quality. This latter is identical with that sensation which would be excited if the light acting through one stimulation were distributed uniformly over that entire stimulation period.

Under these conditions there are four factors which promote the production of this constant sensation:

- 1. The decrease of the stimulation period.
- 2. The increase of the difference of duration of the two stimuli.
- 3. The decrease of the difference of the intensity of the stimuli.
- 4. The strengthening of the mean intensity of both stimuli.

If the succession of stimuli be given by means of a rotating disc, then a fifth factor enters, viz., the rate of movement. The slower the movement the less do the stimuli fuse. That the influence of these five factors applies to the fusion of colored light is proved in an experimental appendix to this paper.

The theory of Talbot's Law must explain both the general fact of fusion and also the influence of these five factors. This is found in a general photo-chemical principle. The photo-chemical action in the retina is not a summation effect, for if we fixate a white surface for two seconds the sensation is no more intense after the second second than after the first. Nor can it be limited to the 'elementary effect' of the corresponding time element, for then the series of stimuli would never fuse into a constant sensation. There remains the view that it is a function of the elementary effects immediately preceding and simultaneous with the sensation, these forming a 'characteristic effect group.' The excitation in the retina grows with the duration of the stimulus until the duration reaches a determined critical value.

We see, then, that as the equality of light dispersion progresses the 'characteristic effect groups' become more similar not only to each other but also to the 'effect group' produced when the light is uniformly distributed.

With this theory the explanation of the first four factors is not difficult.

- 1. The shorter the stimulation period becomes the more evenly the light is distributed over the whole period and the more nearly the 'effect groups' approach the 'elementary effects.'
- 2. By the increase of the differences of duration of the two stimuli the mean variation of the 'elementary effect' is lessened.
 - 3. This also takes place when the difference in intensity is lessened.
 - 4. By increasing the intensity of the whole series, the single 'ele-

mentary effects' will of course be increased. But with this there must be an increase of the difference which 'characteristic effect groups' shall have in order to produce a notable difference in sensation.

The fifth factor, the movement of contour, requires some further explanation. Suppose we fixate a black square on a white ground. One part of the retina will be affected by the light coming from the square and another by the neighboring white ground, and we see the boundary of the square sharply outlined. Now let us suppose that the square moves very slowly while the eye remains in absolute rest. Under these circumstances every 'characteristic effect group' will be determined by its own time element. There will no longer be a sharp boundary between the white surface and the square, for each point of the retina here will have a different time element, thus giving rise to sensations of proportional intensity. This will cause a gradual shading of the two fields, as the time elements gradually shade into each other in the direction of the movement. With light of a given intensity the width of this shaded portion will be proportional to the swiftness of the movement. If, instead of one dark surface, a series of them be moved before the point of fixation, their shaded portions will gradually widen with the rapidity of the movement until finally they overlap and fuse into a constant sensation. This is the state of affairs when the sections of the color wheel finally fuse. As this fusing process is a function of the movement of the edge of the surface it follows finally that a surface a with movement b is less favorable for fusion than surface 2a with movement 2b.

J. E. Lough.

HARVARD UNIVERSITY.

A Preliminary Study of some of the Motor Phenomena of Mental Effort. Ernest H. Lindley. Am. Jour. Psy., VII., 4., July, 1896.

This is an experimental study of those peculiar automatic movements which one is apt to execute more or less unconsciously when one's attention is concentrated; as, for example, in reading, writing, conversation, study, 'trying to remember,' etc. The material was obtained partly from responses to President Hall's syllabus on 'Some Common Automatisms,' and partly from observations made in the kindergarten and primary grades of the Boston Normal Training School. Something over 600 cases were observed, and the results are tabulated so far as may be. The first table classifies automatisms

according to the part of the body involved, and compares children with adolescents, not only as regards proneness to automatisms in general, but also with respect to the relative frequency with which the different parts of the body are employed by each. In both children and adolescents the fingers come first in the order of frequency, with the feet second. Children not only manifest more automatisms than adolescents on the whole, but are surprisingly more prodigal in the use of certain parts. For example, children are ten times as prone to head-automatisms as adolescents. The latter, on the other hand, are more given to automatisms of the eyes, the jaw and the forehead. The second table classifies automatisms according to the activities which they accompany. In writing, automatisms of the lips and tongue; in reading, those of the body, head and hands; while in difficult recollection, those of the eyes, hands and lips, were most frequent.

The number of these movements was found to increase with the age of the child in the kindergarten, to decrease greatly in the primary grades, and to be more marked in the execution of the smaller movements. The large number of these movements among young children is due to their great activity, their defective inhibition and their proneness to imitation. Many automatisms are 'sympathetic,' i. e., they belong to muscles whose center lies near to that of the muscle in use at the time. Those automatisms which persist among trained thinkers (e. g., twirling a watch chain while speaking), seem to be accessory to the concentration of attention or contributory to the stimulation of the brain-cells. Others again seem to be due to excitations which have been prevented by close attention from entering the higher centers, and must find an outlet by lower channels. Finally, many automatisms of posture, especially in children (e.g., bending the body forward, with the head much too low and on one side in writing, and the feet turned in and resting on their sides, or the soles of one foot pressed against the other leg), suggest a return to the fætal posture, or even to that of 'man's more remote ancestors.'

F. TRACY.

UNIVERSITY OF TORONTO.

Das Gefühl und der Alter. S. Ottolenghi. Zeitsch. f. Psychol.

IX., 321. 1895.

In this paper the writer gives the results of electrical tests of sensibility made on 321 male observers of different classes, and from 9 to 75 years of age. The tests were made with the faradic current, but of the other conditions of the test we are left in ignorance. The tests of what the writer calls general sensibility were, we infer, determinations of the threshold of electrical sensations, the stimulus being measured in volts. The most sensitive on the average were students and university graduates of 19 to 40 years; the least sensitive were the oldest group tested, men of 65 to 75. There seemed to be a decrease of sensibility with increasing age after middle life.

Similar results were found for pain sensibility, the percentage of subjects having the highest of 4 grades of sensibility (90 + volts), being as follows: School children (9 to 14), 6 per cent.; older school children (14 to 18), 31 per cent.; students (19 to 24), 17 per cent.; graduates (24 to 40), 7 per cent.; workingmen (20 to 40), 5 per cent.; older workingmen (40 to 65), 65 per cent.; very old workingmen

(65 to 75), 45 per cent.

Ottolenghi concludes that the sensibility increases from childhood to manhood, and then decreases. His observatious were not sufficient to justify such an induction. He tested but 18 school children of 9 to 14, and but 16 of 14 to 18. Then the men of 18 to 40 were of a different class from his other adult observers. The only conclusion that the figures warrant, that sensibility decreases in old men, is therefore not entirely acceptable. The writer fails to state the results for very young children, since, as he says, they objected to the completion of the test. It is not evident why the stimulus at which the children objected to its continuation cannot be taken as a pain threshold.

HAROLD GRIFFING.

Beiträge zur Psychologie des Zeitbewusstseins. Ernst Meumann. Philosophische Studien, Bd. XII., Heft 2, 1896.

The author interrupts the systematic course of his announced investigations in the psychology of time-consciousness, to publish a cyclus of experiments concerning the illusions of the same. Two cases of time-estimation are distinguished: first, where the interval of time is simply limited by comparatively sudden sensations (judgment of the rapidity of succession of the limiting sensations); second, where the problem is the comparative lengths of continuous stimuli. The apparatus used is the well known 'time-sense apparatus' of the Leipzig Institute. A few details are added by the author to the elaborate description of the apparatus in an earlier article. The method is esentially the same as in the earlier article on the Influence of the Intensity of Stimuli on the Estimation of Small Time-intervals; the inter-

1Philos. Studien. Bd. IX., p. 270 ff.

vals, whether 'filled' or 'empty,' are produced by the electric current, the subject being in a dark room separated from the apparatus, and the length of the comparison-interval being gradually varied from shorter to equal and longer than the constant or normal interval, and reversed. The subject adds, as he did not in the author's earlier experiments, the degree of sureness of the judgment, as, e. g., clearly, very clearly, doubtful, or very doubtful. In the comparison of 'filled' with 'empty' intervals it proved advantageous to let the latter precede the former and to retain the 'filled' interval constant or normal. The point is made clear that the 'empty' interval is, however, not empty, but filled with such sensations as the pressure of the clothing, of the chair on which the subject sits, the rising and fall of the breast from breathing. etc. Both the 'filled' and the 'empty' intervals are produced by sensations of sight, hearing and touch. The number of sensations entering the filled interval is also varied. Further, the author gives a number of experiments to show the effect of artificial 'aids' in estimating intervals, e. g., tapping the finger, breathing, nodding the head, etc.; and another series in which the one interval is 'filled' with mental work, such as reading.

In the first group of experiments the stimuli are sounds; first with the filled interval, and then with the empty interval preceding. The first two tables present experiments where the 'filled' interval includes, beside the limiting sparks, only one sensation. The scheme is 'filled' interval, 1 2 3 In Table I. the filled interval precedes. 'empty' interval, 1-2' The result may be stated as follows: Where both are very short the 'filled' interval is much over-estimated; as the intervals are increased in length the deception disappears in an 'indifferencezone; 'if the intervals are still lengthened, the 'empty' one becomes much over-estimated. The experiments show that these transformations of the illusion occur with all subjects used, but that they occur at different lengths of the constant interval with different subjects. "The length of the interval by which indifference enters is by no means constant." In the next following experiments the 'filled' interval follows, instead of preceding, the empty one, and remains constant. The result is the same, excepting that the indifference-zone lies higher, i. e., by a much longer constant interval than in the former series. In the immediately following experiments the number of sensations increases to 5, 6 and 9, the arrangement of the two intervals being varied the same as before. As a result the over-estimate of the 'filled' interval becomes more marked than before, the indifferencezone being again raised; but the transformation of the deception from over to under-estimate of the 'filled' interval, with the lengthening of the constant interval, remains obvious.

In the second group of experiments the influence of artificial 'aids' in estimating time-intervals is investigated. First, the beginning and ending sensations of the filled time are more strongly marked than the intervening ones. It is comparatively indifferent whether the former are objectively strengthened or merely rhythmically emphasized by the subject; in either case, the deception, although still manifest, is very much reduced. The indifference-zone appears by a much shorter interval than before. In the next experiments the subject was practiced before each hour in accompanying the six impressions of the 'filled' interval with six tappings of his finger, the tapping being continued to the close of the empty interval; the latter is, in this case, compared with the former by means of the number of taps. As a result the deception became greater than in normal experiments, i. e., without the tapping. It was sought to investigate the effect of periodic breathing; but only a disturbing influence appeared, in consequence of which the difference-threshold (U E) was very much raised. 'filled' time was made to follow the 'empty' one, the motor 'aid' continuing through both. The deception of the normal arrangement continued unreduced. Experiments in the rhythmical execution of 'filled' intervals were conducted as follows: The subject made in one case, two, and in another, three hammer-strokes within a given interval; the rhythmical execution adopted in the former case is i 2 and in the latter i 2 3. The strokes are registered on a kymographian cylinder. The two subjects execute the middle stroke of the triple interval somewhat quicker than either of the other two, indicating, among other things, that the triple interval is shortened to make its length seem (in compliance with the deception of filled intervals) to the executor the same as that of the double one.

In the third group of experiments the illusions of filled intervals in the different senses are compared, viz., sight, hearing and touch. The experiments already conducted in the domain of hearing are here repeated in sight and touch, with the same general results as before.

The fourth group deals with the illusion resulting from filling the one interval with a continuous sound, the instruments being the Wagnerian hammer and the tuning-fork. The sound produced by the former, after being telephoned to the subject in the dark room, is a peculiar whirring noise. Where the 'filled' time follows the 'empty' one, the result is in general the same as before; but in this arrange-

ment the difficulty involved in letting the filled interval be varied and placed before the 'empty' one is not present. Where the sound is discontinuous, and the interval inconstant, there arises a momentary uncertainty as to the last hammer-stroke or other stimulus, which disturbs the judgment. The result of varying an interval filled with continuous sounds, while the 'empty' one is constant or normal, is, in general, the same as before; but the quantity of the illusion is much less than before, showing that the two cases are in fact very different.

In the fifth group the effect of filling the same interval differently is investigated. The stimuli are the already mentioned varieties of light and sound sensations. The first interval chosen is short, viz. 0, 4 s, and the result is in every case an over-estimation of the filled interval. When the stimulus of the 'filled' interval is continuous, the over-estimate is less; the application of the tuning-fork showing the least illusion. The second interval chosen is of medium length, viz. 1, 0 s. Here the over-estimation of the 'filled' interval is confined to the cases of discontinuous stimuli, the continuous stimuli producing here an over-estimation of the 'empty' interval. When the stimulus of the 'filled' interval is rhythmical, the deception is reduced but not eliminated. The third interval chosen is comparatively long, viz. 8, 0 s. Here the empty interval is clearly over-estimated.

In the sixth and last group the one interval is filled with mental work, such as reading a series of letters on the revolving cylinder of the kymograph and combining the same into a word, the apparatus being so arranged that only one letter at a time was visible; and again, the counting of a number of lines which appear in successive groups simultaneously on the cylinder. In this case the 'filled' interval is more or less under-estimated and the 'empty' one over-estimated.

Merely the general tendency of the author's explanation of the different illusions of time-judgment can be mentioned here, viz., the direction of the attention either to the time-relations themselves, or to the content of the intervals. In the last group of experiments, e. g., in reading letters and combining them into a word, the attention is at first absorbed with the letters themselves (i. e., with the content of the interval) and the interval is estimated too short. As the letters become better known, the attention is directed more to the time relations of the two intervals which are as a result more correctly estimated; finally, the letters become familiar, the 'work' is pleasant, and the 'filled' interval seems shorter, owing to the feeling of pleasure which accompanies it. At the close of the article the author gives about 15 or 20 short statements of results of the experiments which cannot be repro-

duced here. The article is rich in detail which we have not touched upon and which the student will do well to read in the original.

GUY TAWNEY.

NEW BOOKS.

- Grundriss der Geschichte der Philosophie zum Selbststudium und für Vorlesungen. Dr. Johannes Rehmke. Berlin, Carl Duncker. 1896. Pp. 308. \$1.35.
- Yoga Philosophy. Swami Vive-Kananda. London, New York and Bombay. 1896. Pp. xi+224.
- Infallible Logic. A Visible and Automatic System of Reasoning. THOMAS D. HAWLEY. Lansing Smith Printing Co., Lansing, Mich. 1896. Pp. xxviii+659.
- Sense of Beauty, being the Outlines of Æsthetic Theory. George Santayana. New York, Charles Scribner's Sons. Pp. ix+275. \$1.50.
- Leibnitz's New Essays concerning Human Understanding. Translated, with notes, by A. G. Langley. New York and London, The Macmillan Co. 1896. Pp. xix+861. \$2.25.
- Education of the Central Nervous System. REUBEN POST HAL-LECK. New York, The Macmillan Co. 1896. Pp. xii+258. \$1.00.
- The Power of Thought. John Douglas Sterrett. With an introduction by J. Mark Baldwin. New York, Charles Scribner's Sons. 1896. Pp. xiv+320.
- Flements of Psychology. George Croom Robertson. Edited from notes of lectures by C. A. Foley Rhys Davids. New York, Charles Scribner's Sons. 1896. Pp. xiii+268.
- The Life of James McCosh. Ed. by W. M. SLOANE. New York, Charles Scribner's Sons. 1896. Pp. vi+287. \$2.50.
- Grundriss der Psychiatrie. C. WERNICKE. Th. II. Die paronoischen Zustände. Leipzig, Thieme. 1896. Pp. 178. M. 1.30.
- Gustav Theodor Fechner. K. Lasswitz. Edited by R. Falcken-Berg. Frommann's Klassiker der Philosophie, I. Stuttgart, Frommann's Verlag. 1896. Pp. viii+204. M. 1.75.
- Hobbes' Leben und Lehre. F. Tönnies. Frommann's Klassiker, II. Stuttgart, Frommann's Verlag. 1896. Pp. xiii+232. M. 2.
- S. Kierkegaard. H. Höffding. Frommann's Klassiker, III. Stuttgart, Frommann's Verlag. 1896. Pp. x+170. M. 1.50.

Geschichte des Unendlichkeitsproblem. J. Cohn. Leipzig, Engelmann. 1896. Pp. vii+261. M. 5.

NOTES.

The American Psychological Association will meet at Boston on December 29, 30 and 31, which are also the place and time of the meeting of the Society of American Naturalists and of the affiliated Societies. It is proposed to hold a discussion on the morning of December 30. In the afternoon President Fullerton will deliver his address, and the business of the Association (including the reports of committees) will be transacted. It is proposed to group the papers of an experimental and physiological character on December 29, and those of a philosophical character on December 31, so that members wishing to attend two days only can do so. An effort will be made to keep the sessions short and to allow ample time and opportunity for social intercourse. The program promises to be of special importance, and part of the proceedings of the other Societies are such as to be of interest to psychologists.

A PRIZE of £50, to be called the 'Welby Prize,' is offered for the best treatise upon the following subject: The causes of the present obscurity and confusion in psychological and philosophical terminology, and the directions in which we may hope for efficient practical remedy. Competition is open to those who, previously to October 1, 1896, have passed the examinations qualifying for a degree at some European or American University. The donor of the prize desires that general regard be had to the classification of the various modes in which a word or other sign may be said to possess 'meaning,' and to corresponding differences in the conveyance or interpretation of 'meaning.' The committee of award will consider the practical utility of the work submitted to them as of primary importance. The essays, which may be written in English, French or German, must be type written and extend at least to 25,000 words. Each should be headed by a motto, and accompanied by a sealed envelope containing the name of the writer. Manuscript from America should be sent to Professor E. B. Titchener, Cornell University, Ithaca, N. Y., and must reach its address not later than October 1, 1897. Other members of the committee are Prof. James Sully, London; Mr. G. F. Stout, Aberdeen; and Prof. O. Külpe, Würzburg. A French member will be added.

A COMPLETE edition of the works of Descartes, in honor of the third centenary of his birth, will be published under the auspices of the French Ministry of Public Instruction. It will contain not only his philosophical and scientific publications, but also five volumes of correspondence. The scientific works will be edited by Prof. Ch. Adams, of Dijon, and the scientific works by M. P. Tannery, of the Collège de France. The edition has been planned by the editors of the Revue de Metaphysique et de Morale, 5 Rue de Mézièrs, Paris, and subscriptions sent in their care will be filled at a large reduction in price.

THE Paris Academy of Moral and Political Sciences has awarded the Bordin prize of 2,000 fr., the subject for which was this year Kant's Ethics, to M. Cresson, professor at Besançon.

A NEW life of Kant by Dr. M. Kronenberg is about to be published by Beck, of Munich, and Prof. Fr. Paulsen has also in preparation a volume on Kant for *Frommann's Klassiker der Philosophie*. Volumes in this series on Fechner by Prof. K. Lasswitz, on Hobbes by Prof. F. Tönnies, and on Kierkegaard by Prof. H. Höffding, have already been published.

DR. H. T. LUKENS, of Clark University, has been appointed professor of education at Bryn Mawr College, and Dr. Colin A. Scott to the chair of experimental psychology and child study at the Chicago Normal School. Mr. J. H. MacCracken has been made instructor in philosophy in New York University. Prof. W. M. Warren has been promoted to a full professorship of philosophy in Boston University. Dr. Guy Tawney (Leipsig) has been appointed demonstrator of experimental psychology in Princeton University.

WE record with regret the death of Dr. M. W. Drobisch, professor of philosophy in the University of Leipzig, who died on September 30, at the advanced age of 94 years.

ALL communications for the editors of The Psychological Re-VIEW, together with books, reprints, etc., intended for review, should be sent during the year beginning November 1, 1896, to Professor J. Mark Baldwin, Princeton, New Jersey.

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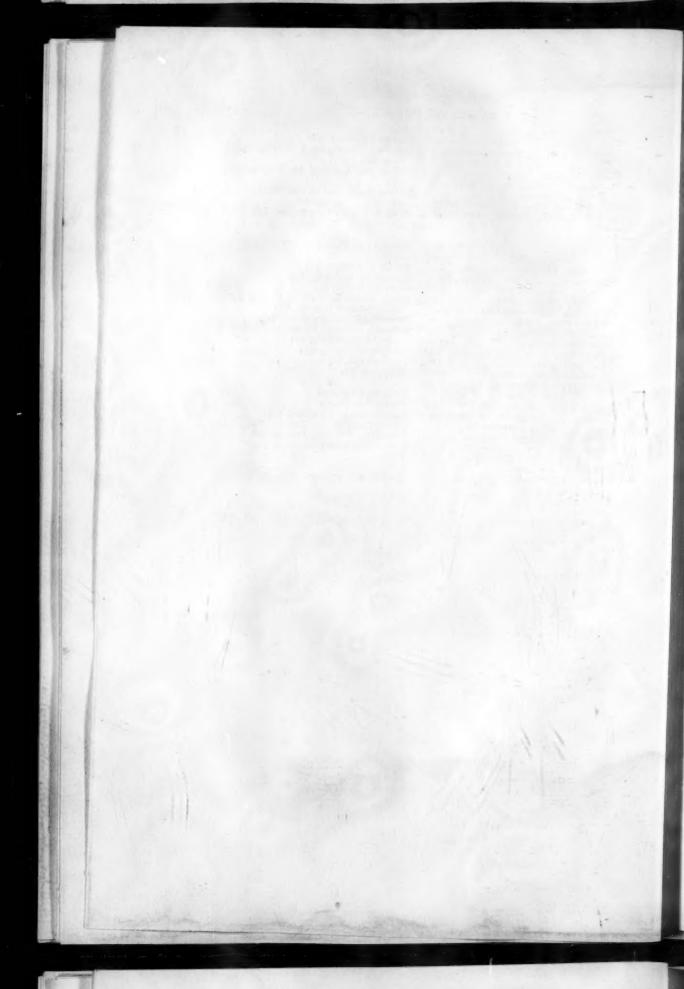
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